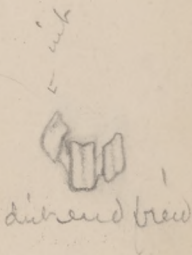
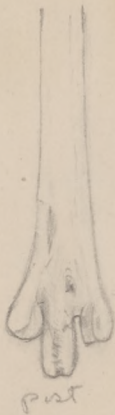


Patagonia - Eocene



5 lbs
Value \$500.00
received
4/26/44
Days boxes
3166
Data on fossil bird collection from Patagonia, copied from G. G. Simpson's field book

Fld. No.

3166	1	301.	Cañadon Hondo, Camp 4.	Bird clay. Party. 3/7/31.	Crocodile skull & jaw...	1 bone
3167	1	303.*	"	"	Odd bird bones, etc. As 301. C.S.W. 8/7/31	6 bones
	1	304.	"	"	Bird bones, odd. As 301. C.S.W. 3/3/31	fragments only
	1	305.	"	"	Odd bones, bird. As 301.	fragments only
3168	2	307.	"	"	Bird, odd bones, As 301	2 <u>Telmabates</u> bones
	1	308.	"	"	Bones, odd, bird. As 301. NG	fragments only
3169	1	309.*	"	"	Bones, bird, odd. As 301. Party. 3/10/31	10 bones + fragment
3170	7	310.	"	"	Many assoc. bird bones - with jaw belonging to 301, partly in block with latter. G.G.S. 3/10/31	24 bird bones more or less depending on how fragments of same bone are calculated
Type of <u>Telmabates</u> here						
3171	1	422.	"	"	Frgs. of bird bones, assoc. "Bird clay," G.G.S. 2/23/31	4 bones & 6 scraps (a tarsometatarsus in 3 pieces counted as 1 bone)
3172	1	423.	"	"	Various assoc. bones. Near 422 and possibly assoc. with it. G.G.S. 2/25/31	4 bones of bird
3173	1	424.	"	"	Assoc. frag. bones. Near 422 & poss. assoc. GGS 2/25/31	1 bird bone
3174	1	425.	"	"	Bird bones. Nr. 422 & poss. assoc. GGS 2/25/31	1 bird bone

~~428~~ 428, 429, 430, 431, 432, 435

Nos. 427 to 435 were found near each other and may be in part associated.

			(427. Cañadon Hondo, Camp 4.	Assoc. frags. As 422. GGS 2/27/31. (Not found))	
3175	1	428.	"	"	Do. 2 <u>Telmabates</u> bones
3176	1	429.*	"	"	Do. 1 " "
3177	1	430.	"	"	Frgs., not contacting. As 422. GGS 2/27/31 1 bird bone
3178	1	431.	"	"	As 430. 2 bird bones
3179	1	432.	"	"	Small piece of clay with bones, contacting one bone in block 433. As 422. GGS 2/27/31 5 bones and fragments
3180	4	433.	"	"	Block with various bird bones. As 422. GGS 2/27/31. 5 bones + 3 frags.
3181	20	434.	"	"	Do. 17 more or less, depending on count of frags. of same bone.
3182	1	435.	"	"	Do. (small) Two bird bones
3183	1	436.	"	"	Misc. bones (contacting). As 422. GGS 2/27/31 1 bird bone
3184	1	438-440	"	"	Do. 438 has 2 bones, 440 2 + scraps
3185	1	441.	"	"	Misc. As 422. Party 2/27/31 8 bones

* 3188 303 1 tarsometatarsus (bird) not referable to Telmabates antiquus
 * 3190 309 1 tarsometatarsus " " " " " "
 439 not here
 * 3180 429 1 very small crocod " " " " " "

Material Available:

- No. 434 -- Right and left (left practically complete, right lacks head.
No. 436 -- Left complete (practically)
No. 423 -- Right and left fragments sternal end; right ant. half, left center section of shaft including scapular facet.
No. 428 -- Right anterior part from scapular facet up, but broken especially along ventral surface.
No. 441 -- Left, head only.

Measurements:

Length from center of sternal end directly to head:

No. 434 -- 43.8 mm.

No. 436 -- 42.3 mm.

Greatest breadth of sternal end from internal tip to top of sternocoracoidal process:

No. 436 -- 27.3 mm.

Length of wide part of sternal facet (from internal tip):

No. 436 -- 16.7 mm.

No. 434 -- 21.1 mm. ?

Depth of head (dorso-ventrally):

No. 436 -- 10.2 mm.

No. 434 -- 11.2 mm.? (small excrescence gets in the way)

No. 423 -- 9.3 mm.

No. 428 -- 10.0 mm.

No. 441 -- 10.0 mm.

Breadth through head (interno-externally) at widest point)

No. 436 -- 5.8 mm.

No. 434 -- 5.9 mm. (may be slightly crushed)

No. 423 -- 5.3 mm.

No. 428 -- 5.9 mm. (crack may give greater breadth than normal)

No. 441 -- 5.1 mm.

Breadth (depth) of neck below head (dorsoventrally)

No. 436 -- 9.1 mm.

No. 434 -- 9.8 mm.

No. 423 -- 8.9 mm.

Ht. from sternal end of scapular facet to tip of head:

No. 436 -- 19.7 mm.

No. 434 -- 19.3 mm.

No. 423 -- 18.9 mm.

Breadth at narrowest place below scap. facet (internoexternally)

No. 436 -- 5.8 mm.

No. 434 -- 6.0 mm. (both right and left)

No. 423 -- 5.7 mm. (left -- other meas. were on right)

Radius left approx 105 mm

Patagonian Eocene bird Coracoid continued

Characters: This coracoid combines characters found in the flamingoes, ibises, and geese. It could possibly be the forerunner of the shorebird type of coracoid, but would require considerable modification.

Details and closest affinities listed below:

1. Sternal end flares broadly, then tapers up to slender body; The sterno-coracoid process is well developed. ^{but the shaft}
The flare is like Phoenicopterus and Apatornis; narrows slightly more than Ph. Sternocoracoid process appears to take off more evenly than in Ph (not indented and then a stuck out point); Apatornis is more like the fossil (judged from illus., the specimen at hand is broken), although it rises to the sterno-coracoidal process more abruptly. Haematopus, too, is similar but most shorebirds have indentation then strong narrow process.
2. Sternal end relatively flat -- slight bow only. ~~Flatten~~.
Apatornis also flat (probably a little more so than this fossil) Phoenicopterus slightly more bowed.
Haematopus perhaps a bit flatter than Phoenicopterus.
Anseriforms flat (probably flatter than fossil)
3. Dorsal surface above sternal end excavated in triangular space. Ventral surface slightly concave particularly on a diagonal from where intermuscular line reaches its distal extreme across to internal rise.
Apatornis: dorsal area similar to fossil but deeper excavated and triangle goes higher. Can't tell about ventral
Phoenicopterus: Dorsal excavated but more concentrated immediately above the sternal facet. Ventral convex.
Haematopus: dorsal excavated but more centralized. Ventral convex
Anseriforms: dorsal flat; ventral flat to convex.
4. Sternal facet extends up considerably, but forms only a minute shelf (protrusion dorsally). Widest part stops short of external tip, and a narrower facet appears to continue on externally, both on dorsal and ventral surfaces. Internal part of facet also curls onto the ventral surface near internal tip.
Apatornis: Facet extends all across the sternal border, without an abrupt stop of a wider part. Also extends all along ventral surface, too and appears to turn at external angle up toward (but not to) the sterno-coracoidal process. No appreciable shelf.
Phoenicopterus: Wide part of facet stops short of external tip but continuation appears a little wider than fossil. Curls onto ventral surface internally as in fossil, also small bit externally (as in fossil). Some shelf
Haematopus: Facet narrows internally and externally, rising gradually between these points (goes to tip in each case). Only a tiny bit on ventral side. Some shelf
Anseriforms: Vary; geese have blunter internal, tip and are thicker through the sternal end, the ventral curl being more angular and more dorso-ventrally projected. Ducks have very little curl on ventral side.
5. Head symmetrically placed with respect to neck (internal view), with very little projection ventrally, and thickened part extending to ventral edge. Area convex, with undercut below.
Apatornis: Head is a "blob" (convex) better developed toward ventral than dorsal aspect. Not undercut below.
Haematopus: Head protruding slightly dorsally, internal surface slightly concave. Deeply undercut beneath
Anseriforms: Vary from type not unlike Apatornis to geese which are quite similar to this fossil.

5. continued (head)

Ibis: Head similar in position to fossil, but flatter surface and appears more fragile. Undercut, OK

Phoenicopterus: Similar in position to fossil (and ibis): very flat (like ibis), but absolutely no undercut, just a rough border at the neck area.

6. Ventral edge of head bears a marked gash through its center and about parallel with the slope of the neck as it blends from head into the body of the bone. (for biceps muscle?)

Apatornis: Gash centrally located here also, though perhaps a bit farther internally and seems to extend up around the anterior tip more.

Phoenicopterus: The attachment of the biceps is merely a scar toward the external edge of the ventral part of the head.

Ibis: An indentation, centrally placed (with respect to internal and external) on the head is less gash like than in fossil and extends farther anteriorly.

Haematopus and anseriforms have scar on external side of head at its ventral surface, and head is pinched in there. (Tho the scar is also present in Phoenicopterus the head is not pinched in, but is broad.

7. External border of head clearly set off from neck.

Apatornis: Head tends to blend down into neck without a clear demarcation between.

Phoenicopterus: Well marked, but not so much so as fossil.

Anseriforms: Not too well marked and border of head slopes down before the neck starts.

Ibis: Almost as well marked as fossil and ventral contour similar, too.

8. Neck excavated below head, particularly toward dorsal edge. A diagonal rise in the neck tends to separate the ventral and dorsal aspects of the neck. The dorsal-most excavation is narrow toward the head but broadens out and continues at least half the distance to the scapular facet. The ventral-most excavation varies in its depth, usually quite shallow, and limited to just under the head.

Apatornis: No excavations, just a general sloping away under head.

Phoenicopterus: No excavation, neck straight down (doesn't even slope as in Apatornis).

Ibis: The two excavations are present as in the fossil, but the area is more fragile looking.

Anseriforms: Varies from a general over-all excavation to the condition in the geese in which the dorsal part bears the greatest excavation. The division between dorsal and ventral, however, is not diagonal as in the fossil and in the ibis, but fairly straight, and there is practically no excavation on the ventral part. The thickness of the bone is like the fossil (in contrast with the more fragile ibis).

9. Haematopus: Deep excavation all across beneath head.

9. Scapular facet round and deep cup.

Apatornis: Appears to be similar.

Phoenicopterus: Less depressed and less regularly round.

Ibis: A sort of shelf -- no cup

Anseriformes: Cup-like, but not so deep and roundness varies.

Haematopus: Deep cup, but more oval

10. Foramen present close below and under the internal margin of the scapular facet. Close to internal margin of bone and internal margin is not projected. I doubt that the procoracioid was.

Patagonian Fossil Bird

10. continued (position of foramen)

Apatornis: Close below scap. facet, but seems a bit more internal in position.

Phoenicopterus: Seems a little farther down from facet. Internal edge of coracoid extends out into prolonged procoracoid (process) so foramen not so close to border as in fossil.

Ibis: Set way below facet. Long extension of internal edge below marked procoracoid, thus unlike fossil. Foramen thus further from internal edge.

Anseriformes: No foramen except one species (not seen). A notch on internal border may represent where the foramen was. Shape of procoracoid suggests what the fossil probably was like.

Haematopus: Position of foramen similar to that of fossil but internal edge is more extended so foramen farther from it. Other shorebirds either have no foramen or it is lower and tiny on internal margin.

11.

~~11z~~

Although the majority of shorebirds have a very different appearing coracoid from the fossil, Burhinus and Haematopus are sort of in-betweens and it would be possible to postulate that the much more curved sternal facet, the more ventrally thrust head, ~~and~~ higher sterno-coracoidal process and more extended procoracoid evolved through a stage represented by these two genera.

Burhinus is quite flat across the sternal end and beneath the head is a suggestion of the diagonal line separating the two excavations. The scapular facet is round.

With somewhat less modification the flamingo coracoid could be derived from this fossil. Though it is easier to conceive of progressive excavation under the head ~~more~~ than progressive lack of excavation.

In the case of the shorebirds, it is possible that the curvature of the sternal end was accompanied by the twisting of the head end so that the head protruded ventrally.

Material available:

- No. 434 -- Anterior end (slightly crushed) with ventral manubrial spine and complete border of keel. 2 fragments of lateral portions anteriorly (right and left)
- No. 423 -- Anterior end only -- spine broken; coracoidal sulci incomplete.
- No. 303 -- Not quite as much as no. 423 (more broken on right)
- No. 310 -- " " " " " " " (more broken on left)
- No. 441 -- Fragment of costal border.

Measurements:

- No. 434 -- Depth keel (tip of calipers at center of dorsal edge of sulcus above and just beyond anterior slope of keel, below) -- 38.5 mm.
Breadth through tip of keel -- 21.7 mm.
No other measurements

Characters:

1. Anterior contour of keel only slightly concave. No marked curve such as is found in *Mycteria* or *Phoenicopterus*. Also straighter than *Recurvirostra*, *Burhinus*, *Limosa*. I doubt that the contour or position of the keel is important taxonomically as the ducks and geese differ widely.
2. Coracoidal sulci cross mildly as in *Apatornis*, *Phoenicopterus*, and *Mycteria*, and Ibis, but manubrium less pointed than in *Mycteria* or Ibis -- about as in *Phoenicopterus*. *Apatornis* broadly rounded.
3. Moderately developed spine ventrally (manubrial) with indentation above it on the dorsal lip of the sulcus. But the dorsal lip of the sulcus tends to be a distinct flat shelf all around the anterior margin (shelf about 4.0 - 4.3 mm. wide) In the center -- behind the concave part of the anterior margin -- there is a suggestion of a protrusion though quite small and wart-like. The bone dips sharply down past the shelf and centrally there is a single large foramen.

COMMENTS and COMPARISONS -- The shorebirds have the central foramen and so do the anseriforms.

The anseriforms also have a tendency to the thick shelf (especially the geese). Geese have large excrescence at back of shelf in center. *Burhinus* is rather like fossil in this edge but lacks the foramen. *Numenius* is similar but the curved edge has resulted in greater dipping of the shelf down and back (same curving noted in sternal edge of coracoid)

The shorebirds have no cross over of sulci, but this could have been secondarily eliminated by the moving up and back of the ventral manubrial spine, which in most shorebirds is situated between the sulci rather than directly ventral (seems, again to be associated with the curving of the sulci and coracoid). *Burhinus* has manubrium more ventral in position, not dividing the sulci, and might represent a step between the fossil and other shorebirds. *Apatornis* could have been a step before the fossil (it has a slight groove above the dorsal sulcus -- bet lip and shield -- a faint suggestion of which occurs in *Burhinus*. *Phoenicopterus* has no marked shelf but is thick and slopes down gradually to two foramina with a bar between. Posterior margin in center has a couple of protruberances. *Ichthyornis* has cross-over of sulci, too, but manubrium is more prominent ventrally than in *Apatornis* and crossing more marked. No shelf or foramina.

Material available:

- No. 422 -- a portion of shaft with external condyle attached, other condyles (trochleae) separate and can't find actual contacts.
- No. 310 -- fragment of distal section including internal and median trochleae.
- No. 434 -- a badly crushed shaft, and ^{now attached} separate proximal end may not represent the same species as the distal ends, although other bones of 434 indicate that these 3 numbers represent same species.

Characters of distal end: ~~#310 & 422~~

1. Internal trochlea stands well away from median at anterior edge and then slopes sharply toward the median line posteriorly. ~~Trochleae~~ is separate below the symphysis with the shaft. ^{free but so what}

A similar sloping anteroposteriorly is observable in the shorebirds (Limosa, Numenius, Recurvirostra) and flamingo. However the anterior end stands farther out than in these (partly due to the fact that the trochlear facet extends distal to the symphysis with the shaft (allowing it to be a free trochlea). The flamingo extends out more at the anterior edge, but it, like the shorebirds, is not a free trochlea. The freedom of the trochlea is more like the condition in the rails, as is also the shape of the internal condyle (trochlea).

2. A hind toe was present if we may judge by the well depressed area above the internal trochlea. There is not a true facet here for M I as there is in the ibis (Plegadis and Guara) but the depression is clear and of good size. A marked ridge extends from the internal trochlea obliquely onto the shaft and the depression occurs above this ridge (There is a slightly similar condition in Limosa). ^{specimen no. 422}

3. Proximal to the depression (noted in 2) one of three intermuscular lines runs up the shaft. The other two lines arise (a) a median one slanting in from the middle of the external condyle; (b) an external one coming onto the posterior surface of the shaft from the external edge of the shaft.

I do not find the same arrangement of lines in mod. forms.

4. Distal foramen (seen anteriorly) set in deep groove (23mm from ^{ant. post} trochlea).
5. External side of shaft flat with angular anterior border, and the intermuscular, (b) above, giving an angular effect posteriorly, as well. Cross section of shaft (middle?) a square with rounded edges. Anterior view flat bevelling off on internal side.

6. Bone gives impression of being long and slender as in shorebirds (perhaps proportions similar to Limosa). Breadth of shaft 5.3 mm., Approx. br. dist. 1313 mm. ^{having proportions somewhat as in Agave. Length about 105mm}

Characters of proximal end: Breadth approx. 14.7 mm.

1. On anterior face, 4.6 mm. below internal cotyla are two longitudinal ridges forming a groove between them. Something similar occurs in Dendrocygna and possibly in Haematopus.

2. Attachment of external ligament large and clear on external surface of proximal part of shaft. Again somewhat like Dendrocygna and possibly Haematopus.

3. Internally the shaft at proximal end is set off from hypotarsus by ridge which may be continuous with internal ~~most of the~~ ^{bordered shaft} intermuscular lines mentioned in 3 above. ^{but the internal area is destroyed}

4. Internal foramen about 2 mm. ^{from ridge} along side of inner ^{most} calcaneal ridge. Ridge appears long (11mm?). Other ridges not complete but guess there were at least 3 with foramen under one of ext. ones as in anseriforms and some shorebirds.

The hypotarsus is badly crushed & it is difficult to see whether a calcaneal ridge is present. Certainly on the right side there is a raised area which is the condyle from which the shaft arises. This is the 2nd calcaneal ridge, which is a long central ridge.

Material available:

- 434 -- R and L incomplete (badly crushed; prox. end missing; dist. inc.)
 307 -- L in 3 pcs (badly crushed)
 R proximal (broken)
 310 -- R and L (L in 2 pcs), fairly complete -- full length but sub-
 trochanteric fossa area broken away.
 432 -- R proximal in rather good condition
 303 -- 2 L distal (1 very fragmentary)
 438 -- R and L tips of proximal ends (1 head only, other with fossa)
 309 -- L prox., R. distal fragments
 425 -- L prox. fragment
 422 -- L distal in good condition
 424 -- R distal in good condition
 430 -- L proximal fragment

Measurements

Length: 310 -- 140.8mm.
 Br. prox.: 310 -- 26 plus?
 432 -- 25.2
 Br. dist.: 310R -- 17.7 (gr.br.), 14.1 (br. cond.)
 424 17.5 14.1
 422 17.2 14.3
 303 18.3 14.5
 307 14.5
 310L 17.2 14.6
 Depth dist: 310R 9.4a(int.) 5.7a(ext.)
 310L 10.0 6.3
 424 9.3 5.6
 307 9.6 5.7
 303 9.7 6.1
 422 9.4 6.5
 Across fossa: 432 -- 13.0
 307 12.4
 438 11.6
 Depth head: 432 -- 7.3
 310L 7.8
 310R 7.9
 438R 6.8
 438L 7.5
 309 8.2
 307R 7.8
 307L 8.0
 434 8.0
 Br. sh.mid.: 310L -- 7.7
 310R 8.3?
 434L 8.3?
 Length deltoid from head
 310L -- 48.6
 310R 48.5
 432 45.5

Characters:

1. Subtrochanteric fossa deeply excavated but lacking any pneumatic foramen. Excavation is similar in depth to that of shorebirds, but the median edge of the fossa is practically continuous with the central crest of the shaft whereas in shorebirds there is considerable space between, and shaft crest is well internal to edge of fossa.
2. Intermuscular line on deltoid crest is slightly ~~external~~ internal to central crest of shaft, with distal end of it at junction of deltoid crest with shaft (much like Dendrocygna). In shorebirds the line is closer to the median line both proximally and distally, as it is also in the flamingo; in ibis the line is ~~external~~ internal to the crest of the shaft throughout; in rails it is well ~~external~~ internal, actually ~~xxxxxx~~ on the deltoid crest, near its ~~xxxxx~~ border. Other ducks and geese are not far from Dendrocygna (and hence the fossil), though the distal end is farther in from the deltoid than in the fossil and runs a little distal to the deltoid. *in some*
3. There is no high entepicondylar process with a point such as is characteristic of the shorebirds (with possible exception of Burrhinus). Even in Burrhinus this area, though not high is more prominent than in the fossil. *In fossil entepicondylar process is on a line with (or lower than) the ext. condyle.*
4. Most marked peculiarity of distal end is the upward slope of the entepicondyle from the condyle itself. This character is most closely paralleled in Phoenicopterus, but there is a suggestion of it in the Whistling Swan. The entepicondyle is narrow ^{and thin} ~~and thin~~, having not even the inflation of Phoenicopterus (much less the swan). There is a suggestion of a twist of this epicondyle toward the ^{anconal} ~~anconal~~ side as in the alcid, but looked at distally the distal end tapers decidedly toward the ~~internal~~ edge and the internal condyle is quite small. The reverse is true of the Alcidae where the internal condyle becomes enlarged so that ~~xxxxxx~~ although the anconal side tends to slope internally, the palmar side is so developed that the bone is deeper internally than externally.
5. Greater distal protrusion ^{on} ~~toward~~ external side. ^{contour of distal end} Internal descends gradually to ^{extremity} ~~end~~ from shaft, whereas external juts out abruptly at the epicondylar region, about on a level with top of external condyle.
6. Brachial impression narrow and obliquely placed. Quite deep at its distal margin. Suggestive of Phoenicopterus.
7. Deltoid crest more than one-third the length of the bone. Edge appears rounded.
8. Distal edge of head fairly straight and very slightly overhangs on the anconal side with wellmarked depression beneath it, between it and the trochanter crest. Distal edge of head region plus external trochanter, slopes gradually down toward external side and possibly twists slightly anconally at the ext. trochanter. Apex of head appears to point slightly externally, not straight up as in flamingos, ducks, ect.
9. Attachment ant. art. lig. straight-sided & nearly vertical insertion. Attachment of pronator brevis near the tip of the ant. art. lig. attachment - & small.

*it takes not
join the ext
edge with
well below the
primary crest*

Material available:

No. 310 -- Right and left distal, right proximal
 No. 301 -- Left complete (in 2 pieces)
 No. 309 -- Right proximal
 No. 435 -- Right proximal
 No. 422 -- Fragment of right proximal
 No. 441 -- Right distal
 No. --- -- Right incomplete (on prox. end and M3 broken)

Measurements:

Length to external edge of proximal end and bottom of M2 distally.

310 -- 66.7 mm. ap. (2 pieces held together)

301 -- 63.1

Depth prox. end through process of M1

310 -- 15.7 (int.) 15.9 (ext.)

309 -- 15.6 " 16.7 "

Apatornis 8.7 " 8.6 "

Breadth proximal trochlea

310 -- 6.0 (post.) 6.2 (prox.) ap.

301 -- 6.5 "

309 -- 6.2 " 6.7 "

435 -- 6.8 "

Apatornis 3.5 " 3.7 "

Height M1 (vertical height, not diagonal)

310 -- 9.6

301 -- 9.5

309 -- 9.7

Apatornis 5.4

Height head (dist. between parallels at level of ext. tip of trochlea and lower edge of M1)

310 -- 13.0 309 -- 13.2

301 -- 13.1 435 -- 13.8

Apatornis 7.9

Breadth M2 at lower edge of prox. symphysis

310 -- 3.2 435 -- 3.2

301 -- 3.2 No. --- -- 3.2

Apatornis 2.7

Breadth M3 center

310 -- 5.7 and 5.3 Apatornis 2.8

Breadth distal end

310 -- 6.8 301 -- 7.0 441 -- 6.7 Apatornis 4.3

Distance from distal end of proximal symphysis to proximal edge of trochlea

310 -- 17.7 (ext.) 18.8 (int.)

301 -- 17.5 " 18.2 "

441 -- 15.3? "

Apatornis 7.7 " 9.1 "

Distance from internal tip trochlea to pisiform process

310 -- 12.9

301 -- 12.4

441 -- 10.7

Apatornis 7.1

Characters:

1. External ridge of trochlea well developed (see measurement); has greater depth than internal. Not only is this external ridge deep (as measured) but it extends as far or a little farther distally than the internal ridge, tending to connect with the ridge from M3. Very deep cleft between external and internal ridges in posterior aspect.

Comparisons: No modern form compared has as large an external ridge (shorebirds, duck, geese, ibis, flamingo, ibis, rail). Apatornis is nearly equal, lacks 1 mm. only of the depth of the internal; it is as well developed distally as in the Patagonia bird, and connects with M3.

2. Process of M1 projects almost straight horizontally with slight tendency for the upper surface at the tip to slant downward. Suggestion of excrescence at tip (like geese)

Comparisons: Very similar to geese. Process is also straight out in Apatornis but there is no excrescence in Apa. Scar on tip of process in Apa. runs on the diagonal nearly parallel to internal border; in fossil from Patagonia the scar runs diagonally in from internal tip towards the trochlea.

3. In proximal symphysis, M3 is separated from M2 by a well marked, fairly wide groove (internally) This is not the case in Apatornis where M2 joins M3 evenly and then M3 juts out. Externally M2 and M3 are connected for about 9 mm below the external trochlea, M2 being quite convex, bending around the back to attach to M3.
4. Bottom of pisiform process approximately level with distal edge of trochlea.

Telmabates specimens

Skull	(434)		1
sternum	³¹⁷⁰ 310, ³¹⁸¹ 434, ³¹⁷² 423, ³¹⁶⁷ 303, ³¹⁸⁶ 441		5
Coracoid	434(2) ³¹⁸³ 436, ³¹⁷⁵ 423(2), 428, 441		7
Scapula	310, 434(2) ³¹⁷⁸ 431		4
Humerus	310(2) ³¹⁶⁸ 434(2) ³¹⁷⁹ 307(2) ³¹⁷⁴ 432, ³¹⁷⁷ 438, ³¹⁷⁸ 430, ³¹⁶⁹ 422, 309(2), ³¹⁷⁰ 303, ³¹⁷¹ 422, ³¹⁷³ 424		17
Ulna	310(2), 423, ³¹⁸⁰ 433, ³¹⁸² 435, 309, 441, ³¹⁷⁸		7
✓ Radii	310, 434, 309(3) 441, 422, 431. Add ³⁰³ 303 OK		8 9
Carpometacarpus	310(3), 301, 309, 422, 435, 441, ³¹⁸⁷ no.?)		8 8
✓ Femur	310(2), 309, 303(2)		5
✓ Tibiotarsus	310, 434(2), 433. Add ³¹⁸⁰ 3180, ³¹⁸¹ 3181, ³¹⁸² 3182		4
? Tarsometatarsus	310, 434, 422, 439 , 441. No		5 4
Fibula	³¹⁷⁵ 428, 433		2
Vertebrae	310(5), 303		6
Pelvis	310(sac), 440 (frag.)		2
OK Pedal phalanges	310, 434(5), Add ⁴²⁹ 429 OK		6
OK Wing phalanges	310 ⁴³³ 433. Add ³¹⁸⁰ 3180 OK		1 - 2
Tarsula	310, 434		2 ↓
			91 = 91

pedal phal 429?

Ulnae 310, 429, 433, 434 (2) 6(-1-5)

429 - small & separate from others (two prob'ly related?)
310 and 433 quite similar

434 may be separate from 310 & 433

7 ¹⁻⁸ Ulnae 310, ^(24 dist) 433, 423, 435, 309, 441 ^{d d}

423 - different from others

4 Scapula 310 (prox & dist); 309 (prox); 303 (dist);

310 & 309 prox look somewhat similar tho 310 is chipped &
309 crushed so impossible to be sure.

303 & 310 (dist) are different - quadr.

Humeri 18

310 R^L, 422 dist, 425 prox, 424, dist R, 434 LFR (prox and broken) 433 dist R
~~307 (dist, prox)~~ 309 dist R prox L (frag); 303 RTL dist; 438 tips of prox RTL; 432 R prox;
430 L prox; 307 L (in 3 prox frag) R prox

434 seems to have more flaring int. dist end than 310 or 307
and position of epicondylar scar runs transversely into the bone & not
vertically. 433 seems to have both scars fits 434 & 310 together.

310	434 ?	310
307	433	307
422		425
424		309
309		438
303		432
		430

prox all alike
(at least in gen.
(may be specific var. tho
doubtful)

Humeri

R L
① 310 — 310
① 424d — 422d
① 434 — 425p
433d — 434
① 309d — 309p

R L
303d — 303p ①
438p — 438p
① 432p — 430p ①
307p — 307

Coracoids 8

434(LFR); 436L; 423 Lpg, R2frag; 428 Rupper; 441 tip of prox

434

436

428

423

441

all the

Caprometacarpus 9

310^{RTL dist} prox R; 301 L; 309 prox R; 435 frag prox R; 441 dist R; no data dist L; 422 frag

310

301

309

441

435? no data is shorter

can't tell about 422

Scapulae 5

434, 423, 303 (manubria) appear similar, 310, 441
part of right side same?

Scapulae 3

310 R; 434 L R; 431 R inc; all same

Radius 4

310 comp.; 441 dist; 422 prox; 434 inc in several places; 309 2d, 1 prox, 1 sh

310

441

422

434

Tarometatarsus 6

309 frag. middle

303 prox tip DQ. SP.

441 tooth (1)

✓ 310 dist frag with 2 tooth.

✓ 434 tarsus in 2 places

✓ 422 dist end (3 tooth neg loosely fitted → 1 fits)

434

2 humeri (at left) 1 frag extra belongs to R?

1 Varsus? (2 pcs?)

2 coracoids R & L

2 scaps. (1 in 2 pcs) R & L

2 pcs of radius (+ several scaps)

Sternum (4 large pcs + several scaps)

5 pedal phalanges

3 large pes tibiae, many scap (1 R 1 L rep'd) don't look quite alike.

3 frag furcula (looks as tho 2 inds. might be rep'd)

7 frag skull (1 large)

9 frag " (1 large)

2 boxes misc scaps

~~4 boxes~~

423

Lepr prox ulna

coracoid - 3 frags L, 2 frags R

1 frag Sternum (manubrium)

422

* dist end humeri (looks like mate to 42x)

prox end coracoid (R)

prox end radius

dist end tarsometatarsus (2 toes very loosely fitted)

5 scaps of shaft

1 scap of ?

425

1 prox frag humeri

* 424, dist end humeri (looks like mate to 422)

2 humeri (in 2 pcs) (rt + left)

Sacrum (in 2 pcs)

^{approx. 1/2} Vertebrae with sacrum

4 (or 5?) + 1 caudal

femur (in 2 pcs) (rt)

distal end tibia (left)

1 frag sh. tibia? (belong with above?)

dist. end tarsometatars. (2 each, one) (rt)

scapula (ant. end) (left)

frag. wing phalanx

dist. carpometa. (left)

manub. comp. " (rt)

2 frags. of rad. (maybe same bone)

(distal. $\frac{2}{3}$, prox $\frac{1}{3}$ -)

1 prox $\frac{1}{2}$ - ulna - rt

1 dist $\frac{1}{2}$ - " left

2 frags ulna (1 is prox left?)

1 is part of sh.
R or L?

Box with frags of clavicles? (5 frags.)

Box with frags of sternum? (6 bits + 1
recog. pc.)

1 box with 6 small frags (pedal phal., 2 wing phal., 1 rib, 1 acetab., 1 sh. of?)

2 boxes scraps

301 — similar to but shorter than 310

carpometacarpus

309

4 frag. radii (2 indivs. rep'd as 2 dist. ends are same side)

prox end carpometacarpus

dist end ulna

prox & dist frag. humerus

1 end of ~~centrum~~ of vert (very large)

* very small coracoid (can't be same ind. as others)

prox end femur

dist frag. ext. & fibular condyles of femur

frag. pedal phalanx

frag. trochlea of tarsometatarsus (pedal phal. not found)

304

3 frags of ? (1 may be a femur)

436

related to species rep'd by 434

coracoid

frag. of ? (humerus dist?)

438

2 prox frags of humeri (rt & L)

303

2 dist ends humeri (2 indivs.) (1 is quite like 307)

prox tip tarsometatarsus

dist frag. femur

vertebra

prox rad. frag.

- 433 — Bird appears similar to 310 in Area
 Starred
- * ulna (prox half)
 - * dist humeri
 - * dist tibia L
 - 1 frag. pelvis? (element not rep'd in 310)
 - Libula (" " " ")
 - * wing phalange
 - (frag which looks reptilian)

307 (may be like 310 & 433?)

Portion of R & L humeri

L is in 3 pcs

R is one prox end only

441 same as 310?

Distal end ulna,
 clav. part of coracoid
 dist. end radius

1 wing phalange

1 block of carpometatarsals

1 carpal bone (scapholunar?)

1 frag. costal edge of sternum

1 dist. end carpometatarsal.

308 NG + scraps

306 NG - scraps

440 - frag. pelvis

frag. costal end of sternum

misc scraps (8 or so tiny ones)

432

2 frags humerus (cannot belong to 434 as these parts
are already present)

429

Dist tibia (small)

pedal phalanx

430

prox frag hum

435

prox frag carpometa

prox end ulna (mate to 433?)

428

prox coracoid (unc.)

prox fibula

4 scraps

431 prox rad?

scap. (unc.)

misc.

No data

4 frags, one of which is a part of a
crushed carpometa

Other misc boxes NG

Characters of Patagonia Bird - cont'd

(3)

Radius

Prox end

Facet rather square in outline

Anterior ridge proceeds ^{obliquely} distally from edge of facet for about $\frac{1}{4}$ "

Making a sort of Δ space with this ridge is a well depressed lig. attachment (facing laterally)

Protrusion of head on opposite side from this " Δ " moderate & rounded

Dist end

Well marked (high) papilla about centrally placed just above dist surface

Dist surface has slight oblique slant

Ulna tarsus - Distal end only

Ant side

Raised ridge runs prox. up ext side of shaft above ext cond. to a pt slightly above level of prox. edge of spicatus bridge. This bridge is high ant. post.

Outside of this ridge is the well marked groove for peroneus profundus muscle.

Internal condyle narrower ant-postly than ext, ant. by ^{separately} long.

Ext. condyle more round throughout

Dist. lig. prominent as well raised pointed papilla

Small tibial tarsus

The ridge on ext side of shaft dist'y is shorter (prox'y) and the groove for peroneus profundus is not beside ^(ext to) but above (& ext) to it. Beside the ridge at its base (ext.) is a small perforation

434 - coracoid R+L ① indus
 430, 432, 433 " frags ② indus

433 + 434 are sep. indus
 as 434 has 2 comp. humeri,
 433 has 1

428 - coracoid distal part ① "
 438 RL prox R+L humeri (dist. part) 434 frags unident
 303 2 L dist humeri, (count 1 as only 1 good)

428, 430, 431, 432, 433 = 2

434 = 1

310 = 1

438 = 1

303 = 1

436 = 1 L coracoid
 same indus as 428 or 434

301 = 1 IL carp. (pres. dif
 from 434 both
 carp present in 310)

309 = 1

422-425 = 1 dist hum. match?
 no deeps, & found near

303 = 2

not Brachyabatis
 303 prox tarsus distal part?
 429? dist tibia
 309 tiny coracoid

310 = 1

422-425 = 1 prob'ly

428-433, 435 = 2 "

434 = 1

307 = 1

438-440 = 1

309 = 1

303 = 2

436 = 1?

ulnae of 433 + 435 may
 belong to 434

428 prox R coracoid } C
 " R fibula } "assoc. frags
 2 frags } "bird bones"

different?

(429 dist R tibia small } "assoc. frags"
 ped. phal. } "bird bones"

430 prox L frag humerus H

431 prox frag. radius

432 prox half R humerus H
 sh. frag of humerus? (same bone?)) "Bird bones - one has
 contact on block #453"

433. dist^(prob) L tibia
 dist R humerus H
 ulna R prox. U
 cerv. vert (SMALL)
 wing phal.
 left fibula
 frag acet. of pelvis (unident.)

★ reptiles or amphibians
 435 prox L ulna (U)
 prox R carpus

Humeri 2 indivs at least in 430, 432, 433, + distinct from

434
 ulna only 2 rep'd (433) 435 made be R & L 1 indiv

Coracoid 428 1 434 1 = 2

AMNH specimens Patagonian birds (Eocene)

	310	434	432	303	436	307	304 and 301	309	438 and 433	422	423	424	425	440 and 441	428	435	430	431	432	433
1 skull	O	frap*																		
4+ stemm	frap*	keel*		manub,							manub,			costal edges both sides						
furcula	?	frap					3 (rap? 304													
vertebrae	5*			1																
6+n- coracoid		sup*			left comp*					3 (hops 2R "				prox	prox					
3 scap	R *	R*																frap		
10+ humerus	2 comp* R, L	RL	prox*	dist*		prox R dist*	prox dist	2 prox 438	dist mate to 422			dist mate to 422	prox frap				frap	frap	dist	
6 ulna	prox*	RL				prox*					L prox						prox mate to 433		prox mate to 433	
radius	2* epist	1* epist		prox frap				4 hops 2 undist	prox									prox		
pelvis	sacrum*																			
femur	3 prox RL			dist frap				prox hy dist												
tibia	2L *	RL						dist* 433												dist
fibula	O																			1
tarsus	2R *	frap						prox trach		dist*				trachlea						wing
phalange	ped (1) wing*	5 ped 3*						frap						ungual						
carpometacarpus	RL						L 301 comp	prox						dist				pedal		

comparisons of modern avian orders & families
with Eocene birds of Palmyra
Grebes, Humerus, coracoid, ulna, radius

Grebes

Colymbus holboellii

Humerus deeper cut under median crest & head overhangs more
distal end deeper cut on palmar surface

Coracoid - has large round, deep hole for contact with scap.
(a bulgy lump in reb) also a prom. proc. which grebe
doesn't have & furcular facet overhangs (grebe flut)

Carpus - M₁ sticks out forward (grebe up)

From here - only likenesses mentioned

Procellariiformes

Diomedea nigripes & *Puffinus griseus*

M₁ in Puffin sticks straight out but donna bit & is blunt
not pointed, Nothing else similar

Sauviformes

G. stellata & Pacific

process & foramen on coracoid. Nothing else similar

Pelecaniformes

Pelecanus oc.

Coracoid has deep pit but is otherwise quite different

Sula

Ciconiiformes (Scapula introduced here - not compared above)
Egret Coracoid with deep pit & proc. (no foramen tho & otherwise dif.)

Euxenna

Humerus - tendency to raising of internal edge of dist. end

Coracoid as in egret

Thises (*Plegadis* & *Quao*)

Humerus - very slight tendency to under cutting beneath median crest

✓ Flamingo Coracoid - overhanging furcular facet, & proc. - otherwise dif.

Flamingo

Humerus distal end raised on internal side (as also in *Euxenna*)

Scapula not so far off tho not close either

Coracoid - process foramen & some overhang of furc. facet
(not much of a pit tho)

Ulna - ext. facet lip down onto shaft & connection to
little bumps there (dist. ends are not alike)

Anseriformes

Cygnus -

Humerus - Tendency to some excav. T. dif. (prox)
Distally - int. edge raised (see also Flamingo)
+ Eximia

Coracoid - overhang to humeral facet - tendency to pit
proc. present but no foramen

Ulna - ext facet tends to hang down + connect to shaft
(see also Flamingo)
Distal end more like fossils than in Flamingo.

Scap. - Tends to be similar but not close

Calcromela - M1 goes forward but is rel. deeper prox-distally

Anser

Ulna - distal very close partic. in shape of proc.
~~the~~ beak of troch less slanted over ~~some~~
prox less similar than Flamingo

Coracoid - humeral facet overhangs. Deep pit + proc.
present (no foramen) not as flared
at sternal end (Flamingo closer here)

Calcromela - very similar

Scap - very similar

Humerus - some excav under med. crest tho dif.
dist end not like it (farther removed
than swan or flamingo)

Check the Oecumenidae

~~Brachyacanthus~~ ^[Later called Telmabates] is Palaeolodus
(= Telmabates apiculatus)

Palaeolodus

lig. tubercle situated above
the ~~ext~~ condyle

Slight protub. at inferior
opening of tendinous groove
(said to be similar to Tetastoma)

large intercondylar depression

condyles about as in
flamingo (this illus indicates
a little tendency to greater
swing internally & int seems
a little longer than ext.

2 depressions on distal surface

distal end deep ant-post

no trace of tendinous oblique
groove on ext cond.

very slender
accessory aerts only forans
(3 quaters)
~~complicated~~ deep ant post

less inflated than
appears relatively shorter & plumper
than Brachyacanthus
no foramina

ext condyle falls more distal
in extension than internal

not very high back

intermuscular lines little raised
none above wing up bends back
ant'ly

flamingo

above the
suprotendinous bridge

tub. large on lower
edge of bridge

still larger (a bit)

condyles about even
ventral aert'ly &
distally

same (characteristic)

ditto

present markedly

Tarsus

longer but slender
than arbiguus

flamingo

foramine present

less so

higher?

Brachyacanthus Telmabates

above the condyle
like Pal. but ~~higher~~
(or higher / ~~higher~~)

slight protub. at
ext lower edge of bridge

not markedly large ^{NO}

int condyle swings
markedly toward int
side & is longer & less
high than the rounded
ext. one ^{NO}

none ^{NO}

shallower ^{NO}

none here but one
on ext edge of ant. fore
very short / bordered ant.
by protub. mentioned
in it above in the dom
form - but a separate
line borders it ant'ly
in the small species ^{NO}

no in flatness as
flamingo ^{NO}

more like flamingo? ^{NO}

high & bent over face ^{NO}

clear ^{NO}

ant. border of sternal
concave

sternum

concave

furcula * check

Coracoid ^{close to length of} ambiguous but slender

shorter NO

sternal facet less enlarged
than in flammis
superiorly above sternal facet
sup. tubercle narrower than flammis
& less inflated (surface concave)

Below clavicle, facet at each
end a little depression in
which are several pneumatic
foramina

smooth

surface concave

not here
facet continues distally
with body of bone

in Alouatta a narrow corner often
is on the side still narrower NO
but more inflated
(that is more convex)
more convex ventrally than
other depression under
facet seems to be
along middle rather than
just at end. No foramina

suggestion (in illus.) of groove
down front of head as in
Brachycephalus but no mention
in text

tip of ext. glenoid facet comes
well down
dist. attachment long but not broad

ulna

humerus (size of quadruped)

groove in
Alouatta similar
to Brachycephalus
but from middle

this (unless plugged
with matter)
same as Palaeolodius but
more so
rather long in broad NO

bicip. surf. was
inflated than in
confined to edge of bone

clavus

ext. crest projects
slightly

less projects

sub troch. fossa superficial
& no large pneumatic
foramen but small aperture
in the thin layer of bone here

shallow but
some pneumatic foramina
in thin layer of bone

ditto Palaeolodius
except continues
farther toward middle
of bone
less projecting NO?

distally back of scap. deep, but
smaller more rounded than

flammis

distally - int. edge seems to
slope up more than in flammis
(by illus. esp. of small ones)

seems more longish NO
& narrow, deeper distal
edge than above.

similar to Palaeo.
Yes

Carpus size of quadruped

radial process (pur M1?) less
prom. than flammis but very long
ext. crest of troch. shorter than int.
(by illus. - no comment in text)

than flammis
more prominent & shorter NO
ext. as long as int.
NO

(429) Small tibia - similar in ①, ②, ③, ④, ⑤, ⑥ except hammer-

Pat. bird with Haematopus & Squatarola

Pat. fossil

1. bicar (prox not present)

Fossil ① Int. condyle narrower (vertical) than ext. & slightly longer with prominence on line with posterior edge of shaft.

② Intercondylar lig. buds rather high ant. partly

③ Ext. to bridge is a good-sized protub. which runs the length of the bridge along its ext. edge. It forms the ant. border of a lig. groove lying right ext. of ant. on the ext. edge. Clearly defined edges, & about $4\frac{1}{2}$ mm long.

④ Int. cond. projects slightly int. ^{The sides of the} Ext. cond. comes down almost on a line from the ext. edge of the shaft, but the cond. itself protrudes ext'lly, as seen ant'l.

⑤ Depressed muscle scar ant. ^{+ dist} to center of ext. cond (on its ext. face)

⑥ Dist. view of condyles shows inter-cond. space to be a broad, squared surface slanting slightly int.-ward

Figure - ① Post. view dist. end - straight prox border of int. cond slopes a bit distally toward med. line.

② Quad the small depression on dist. surface along edge of int. cond. bordered post'lly & prox'lly by the ant. edge of the int. cond.

③ Post. border of int. surface of shaft forms a sharp ridge rising up from border of cond $\frac{1}{3}$ of shaft but slanting medially as it goes

④ High papilla with pit in middle above fibular cond.

⑤ Tib. cond. short with uneven post. border, 2 depressions on int. surface - prox. most one at post. edge. Other about in center of ext. surface

③ a double protub. (1 dist. to the one mentioned for the other bone) & the main one does not border the groove. The groove is just as clear but is prox. to the protuberance

This is now seen to be present faintly in the larger form & probably corresponds to the protub. on "laminae & lamellae" in dist.

Terrum cont'd Prox end

① Trochanter very prominent above the prox. ant. surface

tending to curve up & inward

② Ant. leg. well marked ridge extends down from troch. about 4 mm from its junction with the prox. ant. surface

③ Post border of ant. surface rounded but make a short angle to come into the head of the femur.

④ Head rises slightly above ant. surface. ~~Surface slightly sloped distally near the head~~

⑤ Ant. surface long & narrow

Ulna: Prox.

① Ext. cotyla with strong downward surface facing almost at rt. 25 to the prox. surface, at its distal tip a high papilla

② Int. cotyla ~~strongly~~ ~~divided from ext.~~ it by high ridge. Ant. border of int. cotyla quite pointed and rising slightly from the base of the cotyla base. ~~When int. cotyla~~ ~~Both cotylae face proximally~~ ~~along rising to olecranon post'ly,~~

③ Papilla below ant. edge of int. cotyla about 3-4 mm down. This papilla & the one below the ext. cot. are almost joined by a third diagonally placed one.

④ Lig. ulnare to ulnar side quite marked with deened rise & swelling of shaft back of it & above as well, so that surface appears deeply indented at its prox. tip.

Tibia Sacmatipes & Plona

Pat ① int cond. narrow & longer than ext

- ② lig. bridge not very high

- ③ protub ext to bridge papilla-like & only a faint indication of a groove ext. to it.

Pat? ④ int cond. projects only slightly to int. side ext about as in ^{most ant. ext cond} ~~Pat~~

- ⑤ muscle scar depressed in ^{most ant. ext cond} ~~Pat~~ & further similar to joint. Tends to be a bit just to center & raised in Plona

- ⑥ very narrow, ^{not so squared} + whole end seems deeper post to the groove

Lemur Pat ① Straight prox border int. cond. (pat surf) sloping dubly toward median part (like Pat)

- ② Depression present but complicated by line sends to divide it into 2.

- ③ Sharp edge of sh (post.) only at junction with int cond. Does not extend up sh

- ④ Small papilla above groove between ext & fib condyles Not as extly placed as in Pat

- ⑤ Tib cond slightly better divid partly, but less so at its upper edge. The upper of the 2 depressions or scars is right at the edge of the cond & causes it to be cut away at that point. The lower one is very slight

Pat ⑥ Breadths of int cond. groove ant. about as in Pat.

Prox end

Pat ① like Pat

Pat? ② Similar to Pat. No. 10 ident

- ③ Border rounded throat - no angle near head

- ④ Head rises less above surf. than in Pat

- ⑤ Ant surface rather broad ext with grad. taper to head

Ulna ① Ext cotyla seems down only slightly at ant tip &
a ridge continues with its ext border runs distally
from it toward median line to join another
coming from ext. edge of shaft. The ridge seems
to take the place of the papilla of Pat.

— ② ~~Ext cotyla no longer has ext~~ Good ridge bet ^{Ext}
Ant cot. round rather than oblong & ant edge
less jointed

— ③ Papilla seems to be replaced by the ridge described
in ① as meeting the ridge from the ext cot.
in mid line. No diagonal papilla.

— ④ Lig. surface broad extending up to the ridge (see 371)
surface of shaft less divided partly.

Burhinidae comp with Pat. fossil

Ulna

- ① Turned down ext. cot, with papilla exactly as in Pat.
- ② Ant border of int. cot. p'd. Cot not quite so elongated as Pat. ext face prox.
- ③ Small pup. below int. cot. & dig also
- ④ Dig. surf. like 1 spec. of *Burhinus bistriatus*

- Tibia
- ① Int. ^{ext} Less narrow than in Pat. More nearly like ext. cot.
 - ② Ht of bridge about as in Pat. but more compressed & notched
 - ③ Near ext. & bridge small & not connected to groove. Groove present however
 - ④ Int. & ext. cond. place about equally (not much)
 - ⑤ Depressed scar present in same place
 - ⑥ Intercond. space deep & narrow

Scrum

- ① Straight border to int. cond
- ② Sharp ridge from sh. to cond (more raised & uneven than in Pat.) runs up sh. toward med. line
- ③ Smaller medially placed papilla ext
- ④ 4 changes of pt of fix. cond because so low
- ⑤ OK?

- Prox.
- ① Prox. hook but prom. is farther forward & not directed over ant. surface
 - ② Ridge ant. OK
 - ③ No ridge to ant. surf. border
 - ④ Head doesn't rise as much as in Pat.
 - ⑤ Ant. surface Δ

cf Pat etc

Scapula ① High process above artic.

② Rounded ball artic with coracoid

③ Facet below ball, ^{heavy, elongate} protruding up at dist. edge

④ Narrow end ^{rounded}

all 3 items agree with flamingos & australiformes ^{except} Geese
except that in Geese there is a foramen below the ball (2)
Most striking similarity is with Cepatornis

Compared to ibis & shorebird

① low

② smallish ball in ibis, larger in shorebirds

③ Broad & flat in ibis doesn't protrude up so much
elongate & flat in shorebird (Numenius)

④ Broad end

cf Bucerotus

① low but more dw. than other shorebirds

② Good sized ball

③ Elong & heavy & a bit protruding

④ narrow end squarish

Comparison Patagonian *Caupomadarca*
with *Heteroscelus*, *Catoptrophus*, *Nannus*
Limn. T. danius, *Phacops* = *Scolopacidae*

In all these modern forms.

Int. crest of tooth has angular distal edge where
it protrudes posteriorly & the posterior edge is flattened
Prox. symph. slightly shorter. Dist. symph. tends to be longer
Shape, hgt & depth of M₁ like *Put* & *apa* & *Phac*
appears to be a slight tendency to exstosis at tip in these.

Alveolar groove marked as in *Put* with some slight
int. also as in *Put*. Deep pit at base of groove also like *Put* & *apa*,
ext. edge of crest not nearly as well defined, however.

Ext. edge of M₃ does not connect with ext. ~~edge~~ crest of tooth
but is in line with it in *curlew* & *Catoptrophus* 1608, 1604, 1607 but int. to it in
T. danius & *Heteroscelus* & *Limn.*
1182 & 832

Recurvirostridae

Beak has higher M₁, Stilt slightly so & heavier
Stilt has moderately long prox. symph. like *put* (Pat) Stilt
longer dist. than in *Pat*. (Nose like *apa*)

Groove less marked than *Scolopacidae* but faint, pit at base
Rather ~~short~~ ext. crest (stops above base of int.) more so
than *Scolopacidae*. M₃ slope was that of ext. crest espec.
in Stilt but in neither does ext. edge of M₃ connect with
int. crest of tooth.

Burhinidae

Suggests *Jacana* in high short crest of tooth, & long tip of M₁
with exstosis (?) Angular post. edge of int. crest

Comp. Pat carpenteria with Gulls, Texas, Jaeger

Int. crest tooth with flat face

Long prox. symph. in gulls like Pat also. concave int. edges

M3, Hefty dip on M1 ^{in gulls} suggestive of Pat

Deep groove starting int. ¹/₂ way as in Pat - also pit but

ext. crest less devel'd tho in Jaeger (565) it comes down

to level of int. M3 off to inside tho its ext. edge does not

correlate with int. crest. It is almost on a line with ext.

(On Pat M3 ext. edge is cont. with ext. crest ^{its} int. edge

with int. crest of tooth. About same in Apa except the

prominence is more int.

NOTE: The reduction in ext. crest seems to
be variable which may indicate that
~~it is a~~ the fossil could be ancestral
to any of those with short crest.

Essential char. of various orders (clear gull order)
which do not conform in Patagonian bird
Charadriiformes

Sternum - No crossing over of sulci in shorebirds
The ant. end varies in that the manubrium may be
vent. only or may be situated bet. the sulci, but
never do the sulci cross-cross as they do in the pinn.

Coracoids - Tendency for sternal end to be short accommodating
to short strongly curved sulci of sternum. Not all are
as strongly curved as the culmen for example, but
none are as broad & flat as fossil. ^{In some a very broad}
(Position of foramen varies & shape of head; head tho
always is shallower and/or more thrust forward,
& curved inward.

Scapula - Short acromion

Humerus - Well marked ectepicondylar prominence & in all but
Burhinus exceptionally high.

Ulna - Too varied within the order to be in part ant. Most have
~~a triangular~~ formed by ridges from ext & int. cot.
& a deep space formed by the int. ridge & the border of the
lig. surface. ^(apert. within fossa) But this is not the case in Burhinus
in the Alcedids.

Radius - quite varied

Carpometacarpus - Not too far removed to be possible. Some
variation within the group

Sternum - Most are not unlike fossil (high trachea over art. surf.)
Position of ant. muscle line usually int. to trach. Neither
of these char. holds, however, in the Alcedids & the
muscle line varies a bit even in others.

Tibio tarsus - Some variation - Tho generally shorter
bridge. Narrower, longer int. than ext. cond
usual & similar to fossil.
lower ext. protub. & groove if pres. above
protub. not beside it at least.

Pausometatarsus - Rel. lts of *Forchileae* similar to
fossil. Prox. end varies in the details which
agree in part with fossil. Some agree, some don't.

Skull - lacrymals always attached, Lateral shows facets
for attachment.

Comparison of ~~Bracheabates~~^{Telmabates} with Scamionis (Telmabates when published)

① Scap. coracoid length from top of scapular facet & distal end = 47 mm. Bracheabates 32-38 (~~about~~ ⁷⁰⁻⁸⁰ ~~20~~ ²⁰). But judging from illus. br. of coracoid is 6 mm in both.

$$\begin{array}{r} 47 \overline{) 38.0} \quad 47 \overline{) 32.0} \\ \underline{37.6} \quad \underline{32.9} \\ .40 \quad .10 \end{array}$$

② Length of humerus
Scap. 153 $153 \overline{) 141.0}$
Brach. 141 = 92% $\frac{137.7}{3.30}$

③ Comparing ① & ② indicates longer & slenderer coracoid proportionately.

④ Since the depth ^{round} & cuplike quality of the scap. facet is so marked in ~~Bracheabates~~^{Telmabates} I believe Dames would have mentioned it had it occurred in Scamionis.

Saunders says of genus Scamionis:
Pars medialis of coracoid not so curved as in Phoenicopstus,
(considering pectoral crest)
ulnar condyle of humerus considerably shorter than the radial condyle

20 = ratio cora to humus scap.

$$\begin{array}{r} 141 \overline{) 43.0} \\ \underline{42.3} \\ .70 \end{array}$$

$$\begin{array}{r} 118.3 \overline{) 21.4} \\ \underline{21.4} \\ .00 \end{array}$$

$$\begin{array}{r} 153 \overline{) 47.0} \\ \underline{45.9} \\ .110 \end{array}$$

$$\begin{array}{r} 141 \overline{) 33.0} \\ \underline{28.2} \\ .480 \end{array}$$

$$\begin{array}{r} 179 \overline{) 51.0} \\ \underline{35.8} \\ .1520 \end{array}$$

$$\begin{array}{r} 179 \overline{) 51.0} \\ \underline{35.8} \\ .1520 \end{array}$$

Brachabates (= *Telmabates* as published)
Brachabates vs *Scamionis*

Scamionis

Scamionis humerus
 supracondylar tuberosity (ext.)
 moderately high & prominent
 (not unlike *flamingo*)

compared as to *flamingo* the
 "ulnar condyle significantly
 shorter than radial" the
 meaning of this is not clear
 from illustration
 intercondylar fossa appears
 to be more marked than in
flamingo

up slope of internal border (dist.)
 not mentioned & not evident
 in illus.

Coracoid

long & slender (heion-like length)

scapular facet is not noted
 as being a deep cup

Vertebra of Parascamionis
 a thoracic, but more anterior?
 heterocoelus part'ly (ant. broken)
 why related to *flamingos*?

Brachabates

Brachabates humerus
 this tuberosity not at all
 prominent & a little lower

The relative size of the 2
 seems about like *flamingo*
 but the intercondylar fossa
 is more clear cut than in
flamingo

internal border (dist.) slope
 up & anteriorly (more even
 than in *flamingo*)

Coracoid

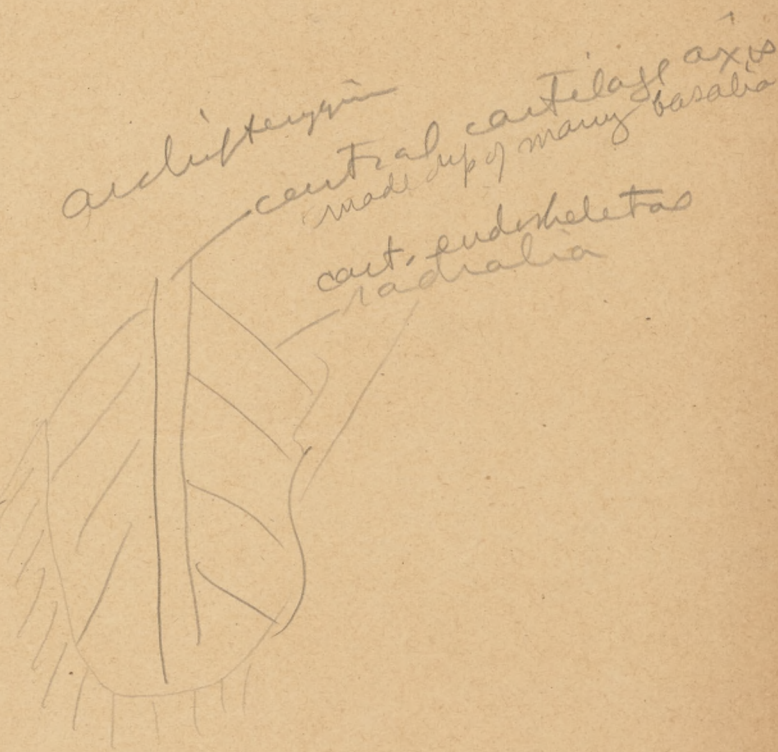
short & slender (*flamingo*-like
 length tho slender)

scap facet markedly cup-
 shaped (deep)

Vertebra

part, thoracic not
 heterocoelus but 5th
 from end is heterocoelus

marginal
xoskeletal
fin rays



Brachyabatis ^{2. *Telmabatis* as published} vs *Elornis* (Go T. *Oligo* Emp)
in *Chaenicephala*

Tibia

Elornis
condyles very nearly equal
& separated by a wide gorge
similar to *flamingos*.
& reflecting broad intertarsal
sub. of tarsus (used in illus.)

Tarsus

Deep ant. groove (like *flam.*)

Humerus
not diagnostic

Belvis
none in *Brach*

Scapula
U-shaped

Brachyabatis
condyles unequal (int.
smaller (viewed ant'ly) longer
(ant'ly) & slant toward int. side.
very mod. dev'tment of intercond.
groove

Tarsus
shallow ant. groove? NO

vs. *Aquodileus* ^{at EO.} tibia only avail
(separate family by *Sauvage* not mixed.
comp. shallow intercond. area
& no encroachment on condyle.
no depressions

Agrost,
intercond. groove very
large & going around the
condyle as in *flamingo*
small depressions (2)
on dist. art. surf as in
flamingo (traces in crane & stork)
Post. intercond. area deep & sharp
& steep sided
No trace of gutter of *flamingo*

~~*Brach*~~
no ext gutter

Brachyabates vs. Aegiptus

Comp. Bat. carponeta w/ ~~Auseu~~
Auseu formen

Length of prox symph similar but M_2 & M_3 more
closely applied (less depression between)

Int crest comes down longer in modern

Development of M_1 similar tho perhaps a little higher angle

Deep groove + slant int'ly but ext. crest is highly
indented + incomplete. Int side of M_3 connects with
int crest, ext side of M_3 stops below base of ext crest

Comparison of Bat carpo. w. Flamingo

M_1 higher + pts up not forward

Long prox symph similar tho even longer, Dist symph
much longer. Convexity of sh down from pte pte
similar Pte pte farther forward

Post groove faint deep but less ind'd ext crest
 M_3 a little int. to edges of crests int crest about
then center of M_3

Comp. Babagonian and Caupometa
w. Guipoma

Crane
Prox symph long but no indent. bet. M3 & M2
Too long dent "

Rails & galleuds Long prox symph M3 on level with M2 main
arc.

M1 more upward slanting + ^{int} crest slopes away from post. not large

post'ly
Very deep pit at base of crests of tooth. Ext crest not
divid below, groove rather evenly divid + indent prox
as well (not in Post + apic)

ext edge M3 on line with ext crest ^{but not connected}
with int. crest or slightly int. ^{int edge on line}

Tooth about same ht as M1 (in Post tooth is shorter)

Swan, B. nig. & Anas cf. Pat.

Femur ① Narrower more rounded int. cond than Pat

② No gap to mesotarsus

③ Raised line & depression on ext side - No papilla in front of int. cond - not at its post edge. Swan only a slight ridge which is well apart from cond.

④ Int. cond even shorter than Pat. Muscles scar is not at post. border except in Anas.

+ Prox ① Troch not raised

② No ridge (most border rough)

③ No angle

④ Triangular shaped ant. sur.

Pat? ⑤ Head raised ^{more than} Pat.

Tibia ① Int cond narrower & deeper than ext

② Bridg low & runs back into bone with Pat

Pat? ③ Protrub. along ext edge of ant sur. tending to border a big groove here as in Pat.

④ Int cond projects markedly into. Ext appears to swell intly also, but may appear so because of swelling at big groove area above the cond.

⑤ Int cond groove ~~more rounded than~~ ^{like} Pat ^{depth of} ^{cond} ^{Pat}

⑥ Muscles scar more prox & not depressed

Note: the main dif. bet Anas & Pat. lies in the ^{presence} of the bridge area & the narrower bridge

- Ulysses ① ext cot. turns down but bluntly & not so far as
in Pat. Ridge at end in groove, papilla - lip scar
in mean, faint scar in dist.
- ② Cotylae face prox ^{important gone not so much indur} pretty broad dist. Dist cot. round
~~or~~ ptd or squarish, not ptd ant'ly.
- ③ Line (not papilla) below int. cot. continues across
diagonally to med. line. Possibly the scar comparable
to the papilla of Pat is another smaller depressed
scar almost at the top edge of the int. cotyla.
The line scar may be likened to the diagonal
scar of Pat which connects ext & int. papilla.
- ④ Lip, very not much depressed nor does shaft edge
high around it.

Comparing carpometa of
Patagonium bird with

Hemipterus & ploncus

Hemipterus has exst. on M₁ as in Pat. Ploncus no.

Pis. from further forward in H. & ploncus but distance

^{from prox abax. to Pat}
M₃ is less concave prox. in H than Pat. ^{carp. of shaft} ~~edge~~ indicated,

however very down ~~shaft~~ from p. 319

Troch. well excavated part ly in H as in Pat. But
ext. crest reduced. M₃ does not run up to contact
base of ext. crest either but its ext. side continuous with
int. crest. (Ext. edge cont. with ext. crest in Pat & Apa
(Kansas like H). Groove slants toward int. crest above with
as in Pat. Lack of ext. crest development below gives
dif. effect than Pat in that region, however.
In ploncus ^{ext} crest is divid to the base (tho above the int. while
in Pat ext. does below int.) & groove is even (as lystr
Suggestion of Mant int'ly in some. M₃ ext. edge follows int.
int. crest in all, never ext.

^{rather}
P₁ ^{rather} ~~short~~ ^{short} in ploncus & H; distance from moderately
short to longer - includes Pat cond.

Jacana way out of this - very short prox. side - long
from to M₁. Very short ext. crest. Rather high M₁.

more int. in heron

Chars of Patagonian fossil Whiteo &
down - agree with Anseriformes

Yes

No

Humerus all have sulci foramen
passing ant dorsal edge
in swans, geese & ducks

crossed sulci

Coracoid Juncular facet overhang, etc
does spec. swan & goose

no foramen. Straighter

Scapula high acromion ~~in all~~

Humerus ~~sloped~~ endepi end in
swan only no others

well formed pneumatic
foramen in anseriform
not in fossil

Ulna Large carpal process
& quad. ridge from ext. cond. to shaft
(Anser, swans)

less rugose papilla prox

Carpometacarpus Prox. of M1 like
geese

ext. crest high above M1
& deeply incised, lacking
depth of fossil

Femur

distally dif. also
High troch (very low
in anseriforms)

Tibiotarsus Ridge & groove similar
Depth dist end narrow
as in fossil

Smother body area
No rug. grained edges in bridge
swayed dist ahead int. ly.

Tarsometatarsus

Broader dist, end + skate
& trochan. ext troch lower
in position.

Skull

lack of lacrymal
corn. differs from
anseriform

A2 ^{radial} claws?

Claws similar + dissimilar,
between Telmatobatis + Phosieraptis
yes

No

* Sternum

Sulci crossed
Palaeobodus also

Heavy ant-dorsal edge + on
foramen
(small, uneven for. in Flamingo)

* Coracoid

Foramen on pectoralis
short body, flared end
Palaeobodus also

Clavicular facet on coracoid
(Coracoid continuous with body of)
bone in Phosier

* Scapula

High acromion
Palaeobodus also

* Humerus

Sloped ectepicondyle
Palaeobodus also

* Ulna

Ext. ^{litt. to} cotyla beaks down
to tooth papilla beak
Papillae prominent
Palaeobodus also

Large carpal process
+ grad. slope of ext-cond
to shaft

Carpometa.

Ext. crest ~~deep~~
Proz. of M. 1 project
forward (Ph. up)

Femur

High trochanter

No pneumatic forams

Tibia

Tarsus

~~3 or more deep~~ deep

3 or more cells in
Anopterus

Essential char. of orders which do not conform
with Patagonian fossil.

Ciconiiformes

Taking note of variability of Herons vs Ibises vs storks
vs flamingoes.

Sternum - all agree in have no sower sulci (except true stork
which does)

unlike fossil Very strongly ~~with~~ on a flat manubrium = herons

Much less so in ibises & storks & flamingoes

unlike fossil Very heavy dorsal lip in ibises with no excav. (storks have
excav.)

Slight foramen dorsally in herons, 2 in ibises (with many small)
only small uneven ones in storks & flamingoes.

Coracoid - (Almost no claw, facet in herons & storks & as far as
unlike fossil below scap. facet)

like fossil (Claw, facet present in flamingoes & ibises (overhang in latter)
Foramen present - low down in ibis, higher in flamingoes)

Scapula all except flamingoes have broad end & no acromion
Herons & storks have best "ball"

Humerus - Porecanalic foramen present but not clearly
delineated. Varies with herons having little ~~number~~ ^{number}
in the area, ibises & storks considerable. Flamingoes
increasingly perforated. Entepicond. divid in ~~ibises but~~
~~storks but not~~ not marked in herons & storks, least
in flamingoes.

Ulna - With exception of flamingoes none have the ext. cotyla
turned down so much that it touches the papilla below
All have a short ext. cond distally which ends abruptly
& does not smooth into the shaft easily as it does in fossil
All have short processes rather than the long downwardly
bent one of fossil. (which is best duplicated in Bucerotus)

Carometacarpus - Herons - long narrow, well united prox.
symp. M3 steps well below int. as well as ext crest of troch.
Thrice have better defined space bet M2 & M3 & M3 touches int crest
int. In all the above M3 bows back from prox symp.
projection looks like herons ext & abis with at prox symp.
flamingo M3 straight down from prox
M2 & M3 at symp. not marked but not so fused as herons.
not so long. M3 better connected to crests (also abis) than in herons.
All have more up-pointed M1 process than Juv. rail

Genus - Ht of troch. varies - does not go above art. surf in Herons
but extends forward slightly; slightly above in ibis & stork
Well above & recurved in flamingo.

Tibiotarsus - All have long bridge & tendency to ^{lip} raised
like protub. at its ext dist edge. (very minor dev. of lip in
herons) Bridge does not sink back - (differs from rails in Phalaropus)
Cranes similar to Ciconiiformes

Tarsometatarsus - Herons unlike all others - 3 ^{troch} very nearly even
& nearly straight across. This & stork slightly
bowed with ext ^{int} slightly higher than mid. & ext the highest
Int. well up & back in flamingo (like crane)
Prox end quite abeyant in flamingo. Herons like crane
than ibis or stork with scutal ridges not longer, tapering
to prox. ends, this & flame 2 ridges (may be mid ridge bet.)
Herons, ibis & storks have round flat facet for
M1 - None in flame or crane.

Skull - lacrymals free as in Juv. rail (crane too)

no heur

Chars of Patagonia fossil which do & do not agree with Ciconia form

Stemum cross sulci faintly

No
dorsal lip & shape of single foramen like acroporiform
- Try Pabelodus
No pne. facet, very thin in heur
& no foramen either

* Coracoid foramen mes. inflam. & ibis
Anterior fur. facet ibis

* Scapula OK for flamingo only (narrow with both acrom.)
(also gasteriform)

* Humerus sloped entepicond (except ibis)

not like any others or crane
(they are broad with low acromion)
No sign of pneumatic foramen

Ulna flammings only in downquad
lip of ext cotyle & finding papilla

not like others
none in distal end
(Bourlious here)

Radius

* Carpometacarpus M3 connection to crests faintly tubular

Heur not at all
long M1 proc not high
deep ext. crest

Femur High troch & pos of nuchal line like flamingo only

Totally unlike heur
Ant contour of gut surf.
No pne. foramen such as flamingo has
papilla layer

* Tibiotarsus Bridge OK

* (less deep dist end
no pit beneath as in flamingo
near ext depressed)

Tarsus flammings distally

unlike any prior - this nearer heur
& crane than flamingo

Skull lack of lacrymal punction on

Scum of Pat. bird most like Quana & Ajaia with high
Lois - ^{two stars (but further down)} Prochander of flamingo & of shorebirds (short in ansures)
Shorebird Position of ant intermuscular line (prox) more like
shorebirds & none in ansures modified in This

* Tibia - Long bridge like ibis (goose much & short)
Goose - This Depth of ditch end like anseriform (i.e. goose)
Goose & scar like goose & some like ibis
Thrust of ditch end goose like but less so.

Ulna - Bothrotylax, most like flamingo also lig. surf.

* Very minute tendency to a papilla at ext. distal
edge of bridge. Not that the crane also
bears a protuber. on the side of the bridge
it is not confined to the distal border
but goes up beneath the bridge

Essential char. of various orders which do not
conform with Patagonian fossil.
Quasi-forms

Stomium - No crossing of sulci & reduced to absent manubrial
spine (except large spine in swan)
All, however have single perforation dorsally
as in fossil (except Whistler swan because
of wind pipe). * Swans & geese & Dendrocygna
have tendency to thick dorsal lips above foramen
like fossil

Coracoid - ~~Except for being~~ Straighter, with less flared sternal
end & less excavated dorsal surface & no foramen.
Shape of prox section (from scap facet & head
int. view) very similar to fossil - degree
overhang varies but always depression below.
Swan & goose closest.

Scapula - all similar in having well marked
acromion

Humerus - Nothing particularly out of line except all
have well defined pneumatic foramen rather
well rounded (not just an open space below the
internal crest as the fossil has)
The shape of the distal end sloped up internally
is nearly duplicated in the Swan ^{the latter}
else is like that (Others all have down ^{to} ^{60°} thrust &
antepicardyle.

Ulna - Hard to specify. Generally less sigmoid & less
marked papillae at prox end. Also less
marked ridge bordering the lig. surface. But
I doubt that this latter is too important.

Radius smooth distal outline & no. from papilla

^{ausent from}
Corymetacarpus - all have marked indentation
on external crest of trachea about mid way up
partly ^{+ ext crest is high about mid M.} by other than This there is considerable
variation (Lent has well rounded well formed
ext crest ^{not} which, however is low over M. 1st.)

Scelus - ^{on all} absence of raised trachea even reduced
in this area (triangular not elongate). No angle
line int to trachea
Dorsally no papilla over ext condyle. No ridge
from shaft to int. cond.

Tiliotarsus - ^{male} Area of budg. much in no ridge
lies more nearly horizontal than in fossil. also budg
is narrower. No other slightest suggestion for "lips" at
ext side of dist edge of budg. Dist end more wavy int'lly.
Ridge ext to budg. & groove ext to ridge similar to joint.
Depth dist end (seen dist'lly) similar to fossil.

Tarometatarsus - Rel shorter - stouter. ^{Rel} Broader dist end
Ext troch descends lower on middle one.

Skull - Lacrymals united over long edge.

Palagonian bird compared with Heron
Heron

Sternum faintly crossed sulci
Deep keel ant'ly
Thick dorsal border dipping obliquely
Single foramen
Markedly crossed & strong spine
shallow keel ant'ly
Moderate border, no deep
Ditto

Cracoid short
about even above & below facet
wide flange to sternaculum
Foramen on procracoid
Scap facet deep, rounded
Furcular facet overhangs
long
short above, long below facet
rather narrow sternal end
No foramen
Slightly shallower & not so rounded
Very narrow & no overhang

Scapula Narrow
High acromion
High ball
Broad
Low
about same

Skull frag. frontal area
narrow
ant. for lacrymals
broad
ditto

Humerus long & slender
Endepicond. raised
Deltoid crest $\frac{1}{3}$ length
about $\frac{1}{3}$ of length

Deep excav. under med. crest
but no foramina
Short ¹/₂ blunt
" ¹/₂ blunt

No excav. but perforations
(foramina)
long & gradual

Carpometacarp. M₁ prev. long
part symplectid thus evident
of M₃ running up to trochlea
Bone of moderate length
Deep extent of tooth

M₁ Prev. up.

M₃ stops at symplectid
long narrow symplectid bone
long

not deep (but this is like
all mod. birds)

low tooth even with artic.
small laminae seen
round border

Scutum High tooth buds separate,
large papilla
squared border of int. tooth,

Tibia Low, long int. cond.

long superficial br.

noty. Carpal bridge + bordering
groove

high short

ditto the Car. so

→ ditto

narrow ant - part in distal view — deep

Tarsus This - like dist. tooth.

shag'ly

Prox with at least 3

calcaneal ridges

→ ditto

Ventelbrae centra of part. Thoracic
last one mildly amphicoelus
then 2 epist. & then
2 tending to be helved.

all mildly helved
(Cassidix formosus)
(Sterna - last 3 mildly
quitted, next 2 mildly
helved, rest helved)

Bones of fossil (Pat) bird
which are unlike flamingo

Tibiotarsus - decidedly so at distal end (both condyles long, some
ext.)

Carpometacarpus - high M₁ proc.; no depression bet. M₂ - 3 in prox
sympth.; high dist. sympth.; reduced ext cotyla

Flamingo & Quana nebra & Ajaja
Tibia, femur, ulna of Pat. ferre

Tibia - ① Int. narrower than ext. condyle & slightly longer
also crane → as in Pat. Protub. not so large (very slight
in Quana, better in Ajaja)

also crane ② Bridge high as in Pat (even a little higher)

③ Protub. ext. to bridge in both Quana & Ajaja
tho the latter not like Pat in length & br.
The protub. is not the border of the lig. groove
The lig. groove runs ext. to it in same
position rel. to shaft & ends as in Pat.

③a Below this protub. is another that projects
out like a shelf over the intercond. space
from the ext. edge of base of bridge

* There is a faint sug. of such a protub.
in Pat!

④ Projections of condyles as in Pat. Int. slightly
int. ext. almost directly below shaft -
slightly to ext.

⑤ Scar on ext. ^{superior} condyle is centrally placed
(not ant and dist. as in front) & is slightly
raised - (not depressed as in Pat)

⑥ Intercond. space slightly narrower than Pat
& whole dist. end deeper, blunt & shape
of space about same as Pat.

scar in
crane too
Pat. has a border of
ext. such, is round
no indent. such as ext.
in the crane

In all of above flamingo shows rel. to his but of shoot
① Ext. as long as int. cond.; ② Bridge lt. same; ③ protub. more
median & groove way ext. on shaft ④ Both condyles project & their
respective sides - the int. slightly more so; ⑤ Scar = a papilla;
⑥ space more rounded & not slanting to get. Bone deep & dist. (3a as in ibis)

7
Jenni
clear not so good? →

- ① in all 3 straight border of int cond as in fossil Pat
- ② Depressin but cond varies in the 3
- ③ Ridge present in all 3 & goes up shaft but higher than in Pat, being more gradual in approaching mid line
- ④ High pitted papilla in Quana; less marked in Agia, & only a real 5 flange
- ⑤ Ant border of fib. cond. ^{opposite} similar to Agia, less so to Quana. Flange has upper

Depressin more prox.
Prox end ⑥ Depth of inter cord groove less but not as narrow
① Prominent fork in all but flange most - even very recessed than fossil then 2 not quite so large.

② Ridge more ext in ^{ibises} along edge of fork in Agia - slight in Quana, Position about as in Pat in Flange but fork, perforated beside it.

③ Surface with angle in flange only thus smooth.

④ Head rim less distinctly in modern 3 than in Pat (about level from ^{ant} facet

⑤ Ant in Quana
Surf. fine narrow in Quana more broadly flared extly in others

Ulna ① Ext cot. beads down in all, but definite angle in flange is not like Pat, Papilla more a mystic line - not clear

② Ridge dividing coxylae best marked in Quana next Agia slight in flange, ant border of int cot. less pitted in all than Pat & basin formed only in flange, all have int cot. rounded not oblong. Cxylae face slightly but in ibises, pos in flange as in Pat.

③ Muscle-car or papilla below int cot. as in Pat, & median one present also

④ Lg, surf. not marked in flange. Sharp milled band, it not in flange - none as much as Pat.

Comparison of Sabazianian and T. Apatania

Caryocarpus

Pat - not quite twice the size of Apa. (Kansan Deth. but
The 2 in size

Extent of M₁ similar in Pat & Apa - also ht. (Kansan
is much higher relatively & of less extent ant'ly

Pat has a tendency to exostosis at tip like a goose
which does not appear in either of the others.

Proform process (int. prox) rel. larger in Apa than Pat
The heavier is similar. In Kans. spec. the process
is prominent but a longer, more slender affair.

In position the proform process is ^{rel. & actually} nearer the prox
end in Apa than in Pat. About midway but the other 2
in Kansan

M₃ is concave at the symphysis in Pat. but ^{in Apa} has
a marked protub. above the place where the two
metacarpals separate. If Pat has a protub. it is
broken but could not have occurred until below

The junction ^{in Pat} is wide at base narrowing upward & slants toward int. side
Trough well grooved posteriorly as far as summit in both
Pat & Apa but not Kansan. Deeper, however in Pat

Crete of trough about equal in development int'ly
& ext'ly in Pat so that depth of prox. end is the
same from M₁ to part & edge of either crete. In Apa

They are close - only one-tenth of 1 mm less ext'ly than
int'ly. They are the same length again in Kansan (ext. & int. equal)
but neither is well developed as in Pat.

The ext. is very much shorter than the
int. in modern birds.

Pat has very long prox symph. ^{moderately} & short dist one

Apa fairly long prox & short (Pro relatively longer than Pat)
dist one. Can't tell too well Kaus - but ^{seems} about same
as Apa.

~~Pat~~ ^{Pat} dist of M2 int'lly as it runs down from pisoron
is convex dropping off to the ^{prox} symph. on one back &
M1 in front. In Apa shape here appears
flat to concave, emphasizing the raising of M3
in symph area. Curvature may have appeared in
slightly only. It certainly cannot have had the
convex ridge from pisoron down.

Thoughts on relationships of Patagonian
fossil bird after comparison of *carpanetacarpus*

- ① Its outstanding characteristic is the very well
developed external crest of the trochlea both as to ant-
post depth & extent distally, tending to be even longer
on the ext. than the int. crest.

The only species which approaches this kind is
Apatomis celer in which the distal dev. of both
crests is the same & the ext. lacks but
 $\frac{1}{10}$ of a mm of the length of the int.

- ② The int. & ext. edges of M3 are practically on a line
with & connecting w. the int & ext crest of troch.
slanting slightly int'ly after connection of int. side
of M3 & int. crest

This situation is similar in *Apatomis*

- ③ M1 bears slight exostosis(?) as in geese,
Haematopus & 1 or 2 other shorebirds. Not in *Apa.*

Similarities of elements of Patagonian birds

Stemum	$\frac{1}{2}$ flamingo ibis	$\frac{1}{2}$ anseriform 2 swans, geese
Coracoid	$\frac{3}{4}$ " "	$\frac{1}{4}$ swan form
Scap	OK flamingo only	OK all
Humer	$\frac{7}{8}$ Ciconiiform	$\frac{1}{8}$ dist of swan only
Ulna		$\left(\frac{1}{2} \text{ none}\right)$
Carp.	$\frac{1}{8}$	$\frac{4}{8}$
Femur	$\frac{5}{8}$ flamingo only	none $\frac{3}{8}$ none?
Tibia	$\frac{1}{2}$ ibis (no r-plum)	$\frac{1}{4}$ dist. end depth $\left(\frac{1}{4} \text{ none}\right)$
Skull	OK	
	$\frac{1}{8}$	
	$11\frac{3}{8}$	$1\frac{5}{8}$

	Apatorius	Palaeodus	Phaeuip.	Aeneip.	This	united
Sternum	yes II	I	I	II	I	
	no	I		I		
Coracoid	yes III	II	I	III	II	I
	no I		I			
Scapula	yes I	I	I	I		
	no					I
Humerus	yes	I	I	I		
	no NONE	I	I	I		
Ulna	yes	III	III	II		
	no NONE	I	I			
Radius	yes I					
	no					
Carpus	yes II			II		I
	no					
Femur	yes III	I	II		I	
	no	I		III		
Tibia	yes	II		I	I	
	no NONE	I	III	I		
Tarsus	yes	I			I	I
	no NONE			I		
Totals	yes 12	13	9	12	5	4
	no 1	5	4	7	0	

yes III I
no III
yes III III
no III

Apatorius
yes
S. II
Car. III
Scap. I
Humerus none present
Ulna
Rad. I
Carpus II

Patagonian bird
characters by elements

Tibia

Flamingo? Sh. Birds

Chars. like

Chars. unlike

Sh birds

3

2

Flamingo ✓

6

1

anseriformes

2

4

Coracoid

Flamingo & Anseriformes

Sh birds

1

6

Flamingo

3

4

This

2

4

anseriformes (then)

3

3

Scapula (Anseriformes)

Sh birds

$1\frac{1}{2}$

$2\frac{1}{2}$

Flamingo

$2\frac{1}{2}$

$2\frac{1}{2}$

This

0

4

anseriformes ✓

$4\frac{1}{2}$

$\frac{1}{2}$

Humerus

Anseriformes & Flamm.

Sh birds

$1\frac{2}{2}$

$6\frac{1}{2}$

Flamingo

$3\frac{2}{2}$

$2\frac{2}{2}$

This

$2\frac{3}{2}$

4

anseriformes

4

$3\frac{1}{2}$

Calometasopus - Auseipome

	yes	no
All birds	$1\frac{1}{2}$	$8\frac{1}{2}$
This Auseipome	$2\frac{3}{2}$	$4\frac{1}{2}$
Auseipome	$5\frac{2}{2}$	$2\frac{2}{2}$
Flamingo	$2\frac{1}{2}$	$7\frac{1}{2}$

Genus

This = Flamingo.

All birds	$1\frac{3}{2}$	$2\frac{3}{2}$
Flamingo	$2\frac{2}{2}$	$4\frac{1}{2}$
This	$2\frac{4}{2}$	$1\frac{2}{2}$
Auseipome	0	$7\frac{2}{2}$

Coccyzine bird differs from Phalaropus

Ulna has high tubercle extending above facet
This is flat in Phalaropus & in Pelecanus

Humerus - internal side slopes up
Extends markedly down in Phalaropus

Coracoid - sternal articulation extends on & both superior
& inferior surfaces. Pelecanus interior only. Phalaropus superior (only?)
Articulation for humerus & scapula not both at
anterior end as they are in Phalaropus, but distributed
normally

Omohyoides slender & straight,
M. III is quite bowed in Phalaropus & Pelecanus.

Of all characters discussed, there are some which appear to be ~~fixxwater~~ more basic than others. A list of these, together with the similarity to other possibly related forms, follows:

	Ibis	Anseri	Flamingo	Stork	Heron	<i>Palaelodus</i>
Sternum						
Overlap of coracoidal sulci	No	No	Yes	No	^{crane} NO	No
Shape of dorsal lip, and foramen	Yes	Yes	No	No	NO	No
Coracoid						
Curvature and proportions	Yes	Yes	Yes	No	NO	No
Shape of furcular facet	Yes	Yes	Yes	No	NO	No
Scapula						
Acromion shape	No	Yes	Yes	No	NO	No
Humerus						
* Pneumatic fossa	No	No	No	No	NO	No
Upward slant of distal end	No	Swan	Yes	No	NO	No
Height and prominence of epicondyle	Yes	Yes	Yes	No	Yes	No
Intermuscular line	No	Yes	Yes	No		No
Carpometacarpus						
Position of process of M1	No	Yes	No	^{NO} in part	NO	No
* Great extent of ext ^{side} of trochlea ^{crest}	No	No	No	No		No
Tibiotarsus						
? — Tubercle near tendinal bridge	Yes	No	Yes	Yes	yes	?
Shape distal end	No	Yes	No	No	yes	No
Supratendinal bridge		No	Yes	Yes	yes	No
Tarsometatarsus						
^{more than 2} Number of ridges in hypotarsus						yes
Vertebrae						
* Incompletely heteroscelous	No	No	No	No	NO	No
Condyles unequally developed & ^{slanting toward internal side}						
Skull & lacrymals	yes	NO	yes	NO	yes	yes

In those characters in which ibis & stork are similar to heron, the first ~~terminal~~ differs from all

Characters of Patagonian bird

STERNUM

- ① Crisscross of coracoidal sulci (but not clear cut) *Phaenocarpa, Mycterus*
- ② Dorsal edge indented
- ③ Good ventral spine
- ④ *above* Dorsal lip, a heavy shelf which *is* *down abruptly where a hole makes position*
(dorsally) of keel *Chlorodrepanis*

HUMERUS
Proximal end

Fossa under internal tuberosity
well excavated -- no pneumatic
foramen

Slightly overhanging head

Deeply cut ligamental groove

Distal end
Bone slopes up from internal condyle
so that entepicondyle is proximal to
the internal condyle.

Entepicondyle straight and bears two
muscle scars (does not slope proximally)

Ectepicondylar prominence low --
on line with (or lower) external con-
dyle

Entepicondylar prominence not very
prominent

Attachment of ant. art. lig. nearly
vertical in position, straight-sided

Attachment of pronator brevis small
and near proximal tip of attach.
ant. art. lig.

Impression of brachial anticus
small, oval and deep at its
distal part

CARPOMETACARPUS

Process of M I extends almost straight forward
straight forward from trochlea and has
slight excrescence on tip

Trochlea well excavated behind
Edges round well back

Pisiform process bottom level
with distal edge of trochlea (approx.)

ULNA
Proximal end

Internal cotyla oval, extending slightly obliquely from olecranon to internal edge. Lips rise at olecranon and at palmar edge, making good depression in this direction.

Ridge between internal and external cotylae well marked, delineating internal cotyla very well.

External cotyla bends distally at its palmar edge (at almost a rt. angle) and is followed by a good ridge running obliquely toward middle of shaft.

Two papillae (bicipital attach.?) on internal side slant toward the above named ridge completing the boundaries of the radial depression (almost a triangle)

Olecranon height indeterminable but appears to curve palmar

Appears that internal side of shaft is high and angular, but this may be due to crushing.

Distal end

Large carpal tuberosity extends from well up on distal end (even with proximal tip of external condyle) as a long convex, rounded crest

CORACOID
Top

Well formed clavicular facet slightly overhanging body of bone

Deep gashed attachment on top of facet on anterior edge,

Neck somewhat excavated

Coracohumeral surface deeply gashed

Deep cuplike scapular facet
closed

Small foramen below the scapular facet (coracoidal foramen or fenestra)

Small procoracoid

Sternal end

Spread widely

FEMUR
Proximal end

Trochanter high, well above
facet and seeming to bend
over this facet.

Muscle line on anterior side
hits trochanter just below
border of facet.

Distal end

Large papilla with a pit in it
above fibular condyle

Muscle line up from edge of internal
condyle obliquely to middle of sh.

TIBIOTARSUS

Distal end only

Anteriorly a short ridge runs proximal
ly above external condyle coming to
a point slightly above level of
prox. edge of supratendinal bridge.

External to this ridge is the well
marked groove for peroneus profundus

Supratendinal bridge high ant-postly

Internal condyle narrower ant-postly
than external and seem elongated

External condyle more round thruout

Internal ligamental prominence a
well-raised pointed papilla

Small tibiotalus

The ridge on external side of sh
is shorter proximally than in the
other tibiae, and the groove for the
peroneus profundus is not immediately
external to it, but above and ext
to it.

Beside the ridge, at its base (extly) is a
small perforation

SCAPULA

A sturdy bone

Small, rather twisted-looking
acromion with a sort of groove
down the back side

Coracoid al articulation is a
decided round ball.

Glenoid facet well-formed and
oval

Bone strongly bowed. Large
papilla about at apex of
bow.

RADIUS

Proximal end

Humeral cotyla rather square in
outline

A slanting ridge proceed obliquely
distally from edge of facet for
about $\frac{1}{2}$ inch. Sort of flattened

Making a sort of triangular space
with this ridge is a well de-
pressed ligamental attachment
(not a papilla) facing laterally

At the distal edge of this trian-
gular space is a scar which may
be that of the biceps (certainly
not a tubercle)

Protrusion of head on opposite side
from that just described, moderate
and rounded.

Distal end

Well marked (high) papilla about
centrally placed just above distal
surface.

Distal surface has slight oblique slant

Scar at lower, outer edge of ligament
al prominence

Stemum
Slightly crossed sulci - Apatornis, Palaeolodius, Phoenicurus
Broad shelf above dorsal lip - geese, swans, Dendrocygna
Broadly rounded anterior edge - apatornis
[Compressed in Palaeolodius]
Single foramen above manubrium. - geese

Coracoid
Short body, flared end - apatornis, Palaeolodius, Phoenicurus
Slender body - apatornis, geese, swans [not apatornis]
Head symmetrical on neck - geese, swans, Palaeolodius?
Head convex with undulant beak - geese, swans, Palaeolodius?
[not Ph, or apatornis]
Rounded deep scap. facet - apatornis?
Undeveloped procoracoid - geese
Procoracoid foramen apatornis

Scapula
High acromion - geese, Phoenicurus?, apatornis, Palaeolodius?
Coracoid artic. a large rounded ball
no foramen (unlike geese)

Humerus
Simple subtrochanteric foramen - NO VE
Simple subtrochanteric foramen - Palaeolodius, Phoenicurus, swans?
up slope internal distal margin - [unlike]
Entepicondyle very slightly dev'd [unlike]
NO APATORNIS HUMERUS

Ulna
Radial depression well marked Palaeolodius, Phoenicurus?
Capitulum tub. prominent. } anser & swans
Grad. slope of ext. condyle to shaft
NO APATORNIS ULNA

Radius

Prox. end — Apatornis only

Carpometacarpus

Great development of extensorient of tubercle — Apatornis
Excurrence at tip of ~~M1~~ ~~metacarpal~~ — Geese
Shape of M1 — Geese & Apatornis

Tarsus

High trochanter — Phoenicapterus, Apatornis [Palaeobus NO]
Position of intertarsal duct — Ph. ?; Apatornis
No pneumatic foramen — Palaeobus, Apatornis
Large pit on papilla — Ibis [one scar in flamingo]
[ANSERIFORMES NO THRU OUT]

Tibia

Moderately deep + blunt int'l. — Geese
Long supratendinous bridge — Ibis
Tubercle above condyle — Palaeobus [Ph. over bridge]
Very faint sig. of tubercle on top of bridge — Palaeobus
[BIG in Phoenicpt]
NO BRIDGE IN APATORNIS
No pits on under side of distal end —

Tarsus

3 or more cupotarsal ridges — Palaeobus [NO Phoenicpt]

Stomach —
Slightly curved rostrum —
Ventral side of mandible broadly rounded —
— Goose —
— Apatornis —

Coracoid

① Head (claw facet)

② Scap. facet

③ Humeral facet

④ upper surface below procoracoid

⑤ Procoracoid

⑥ Muscle scar on head

Chen Aussen foramen

+① very animalar in convexity & overhang

+② Round pit

-③ Region much heavier & lacking points at int & ext. tips - not so broad as

-④ No excav

+⑤ Procoracoid dev. moderate

- No foramen

-⑥ Muscle scar in back of head

Numenius & Limosa

-① facet more slanted toward ant. Surface of bone & more overhang in neck

② Scap. facet depressed as in fossil but oral not round

-③ Bone here very convex (fossil nearly flat) & narrow.

④ Less excav.

-⑤ Procora very long & curved & foramen absent

-⑥ muscle scar on back of head

Stamys

-① Less convex facet & less overhang in neck

+② deep & round

+③ This area very similar to fossil

-④ Less excav.

+⑤ Larger & more curved procoracoid

-⑥ foramen present

+⑦ muscle scars ~~are~~ ^{be} along back margin of head (2 if even)

+⑧ head region not dissimilar this more pneumatic in the under part

-② Scap. facet not a deep cut

-③ straight as in fossil but upper lip not so ventrally placed with respect to lower one.

-④ Depression about equal to fossil but area a dif shape

-⑤ long deep, curved procoracoid

+ foramen but too far from scap facet

+⑥ muscle scar on internal tip of head as in fossil

Scapula

- ① shape of acromion
1a Presence of groove here
- ② Coracoid facet
- ③ Glenoid facet
- ④ Shape of shaft

Mimus & Lanius

- ① Not very high (pointedness varies)
- 1a Sort of a facet, not a groove
- +/- ② Small knob
- ③ Glenoid facet flares well out from shaft & turns upward
- + ④ Mimus has scar like joint then one no

Lanius

- + ① High & flat
- +/- 1a groove present & more marked
- + ② Ball
- + ③ Glen. facet more convex & less upturned No position not far off
- ④ Line not a scar on shaft

This

- ① low acromion
no groove
- ② no ball
- ③ facet flares out & up (like shrike)
- ④ small scar but not otherwise different

Cuscuta

- + ① Pointed acromion
- + 1a Groove appears to be same
- + ② Knob
- +/- ③ More squared off proximally, but plant & tend. to a small surface spot similar to facet
- + ④ Scar & curve similar

Humens

- ① Head
1a muscle scar beside head
- ② fossa
- ③ Contour of beak vent
- ④ lig. groove
- ⑤ Rash, impression
- ⑥ Ht ect epi
- ⑦ " cut epi
- ⑧ Shape of scar above
cut epi
8a position of sub scar

In birds

- ① Depressed beneath in 1 spot
head higher & narrower
1a long & sep. from sh.
- +/- ② fossa similar in length
pneumatic part but narrower
- + 3 Similar
- 4 Deeper groove leading over
under head
- +/- 5 Mphs be deeper distally
but same
- 6 Very high
- 7 On line with cond (beak lower than
fossil)
- +/- 7a horizontal but projects below
- 8 less high & side scar above

Flamingo

- ① Head higher & less depressed below
- /+ 1a muscle scar smaller but position
similar
- /+ ② Very superficial fossa but slight
pneumatic
- ③ longer & more pneumatic
- + ④ Similar
- + ⑤ Similar
- +/- ⑥ Similar tho a little higher
- + ⑦ Similar
- 7a slanting down
- +/- ⑧ Elongated scar tho find the
doesn't project as much
- + 8a similar

His

- +/- ① Similar tho perhaps less excav.
beneath
+ 1a similar
- +/- ② Similar but not so deep & a little
pneumatic
- + ③ Similar
- + ④ "
- ⑤ Shallower & dif sh
- ⑥ Higher
- ⑦ lower
- +/- ⑧ 7a hor'z but bulge below
- 8 rounded & down facing

Anseriformes

- ? ① Variable - some similar
- +/- 1a Goose & swan "
- ② Large pneumatic opening
- + ③ similar
- + ④ "
- ⑤ less deep, more hor'z sides
- + ⑥ similar
- + ⑦ swan similar
- + 7a swan similar
- +/- ⑧ swan high & long but less projects
doubt goose projects but small
- 7a farther back from edge

Jeuur

- ① Position of trachea prox'ly
- ② Shape of ~~post.~~ art. facet (~~partly~~)
- ③ Intermuscular lines (ant'ly
- ④ " " (post-dit.)
- ⑤ Papilla above fibula condyle
- ⑥ Shape int. cond
- ⑦ Shape of ext & fib. conds.
- ⑧ Contour dit. ant'ly
- ⑨ " " post'ly

This

- /+ ① Over art. end but less so than fossil
- +/- ② Close
- +/- ③ No ras near edge as some but not as far into sh as fossil
- /+ ④ A little more rugose distally & less marked up to sh
- + ⑤ Good-sized papilla
- + ⑥ Similar
- ⑦ Tib cond. not as high
- +/- ⑧ Narrower but similar
- +/- ⑨ Similar

Sh. bird

- + ① Curves above art facet
- +/- ② Appears broader ant. part but similar in contour
- +/- ③ Line runs to edge of trach not int to it
- +/- ④ Line up for int cond similar but more rugose
- +/- ⑤ Papilla present (a little less prom)
- +/- ⑥ Less evenly contoured - similar tho
- ⑦ Tib. condyle not as high
- +/- ⑧ Similar but rel. narrower groove
- +/- ⑨ " but less clear contours

Auseiform

- ① Short
- ② Deep ant. part, shallow laterally (reverse of joint)
- ③ To border of trach
- ④ Marked dist. not above, border deep pit
- ⑤ No papilla - a flat scar
- +/- ⑥ Groove similar - not such
- + ⑦ High or but short
- ⑧ Deeper groove on dent
- ⑨ Lacks extra notch in ext cond

Daimingo

- + ① over facet
- + ② Broader ant. part & post. cont. bulges out over foramen
- ③ Line to edge of trach, & a foramen pres.
- + ④ Higher line int. - goes farther up sh. trach but tie in of cond to sh similar
- +/- ⑤ Small scar
- + ⑥ Triangular shape & even contour appears similar
- ⑦ Tib. cond. rel. lower
- +/- ⑧ Sim. but deeper groove
- +/- ⑨ " " " "

Capromitacarpus

Stauzo

- ① Process of M1
 - 1a ht,
 - 1b depth
 - 1c shape
 - 1d groove bet it and tooth ext,
- ② ~~Stk~~ ext tooth
2a pale
- ③ " with tooth
- ④ symphysis (prox) int
- ⑤ " " ext
- ⑥ connection of M3 to tooth ^{Dist} ^{Stauzo} ^{naunt}
- ⑦ with symph

- 1a higher
- 1b less depth
- 1c more curves
- 1d more gone
- ② more oval prox - dist & higher
- 2a less dent
- ? ③
- + ④ similar
- + ⑤ "
- +/- ⑥ almost to ext tooth
- ⑦ higher

St birds

- + 1a sharper
- +/- 1b little less
- 1c 2 dist int parts not blended
- 1d marked
- ② High + narrow
- partly reduced
- ? ③
- ④ short
- ⑤ short
- ⑥ not up to ext as in fossil
- + ⑦ similar

This

- + ① a similar
- 1b less deep
- 1c NO
- +/- 1d shallow but a little more from fossil
- 2 less ant. part depth, depression
- in front
- 2a less dent
- ? ③
- + ④ long
- +/- ⑤ not quite so long
- +/- ⑥ almost to ext tooth
- +/- ⑦ higher

Quasi-fans

- + ① a similar
- + 1b "
- + 1c "
- + 1d "
- ② higher & less deep
- ? ③
- +/- ④ long but not depressed
- +/- ⑤ close
- ⑥ doesn't touch
- + ⑦ same

Coracoid

Stemal end: #436
gr. br. 27.3
br. facet 23.5

ht coracoid 42.3 - 43.8 (#434)

① Stems - coracoidal process elevated 6.9, 4 mm from facet & tip.
in #436

~~something like P. long with 2 lips~~

② Stemal facet & broad for 16.7 mm. Then continues as single surface extending both front & back for another 6 mm. (ap.). (a) facet on int. edge curls up forward with rounded edge as in flammings (some more like a flat overhanging ledge) & shibid (Other part of shibid alter picking).

③ Stenal end (in flared part) fairly flat with slight indentation medially as in apatorius. Dendrocytus deeply indented - also Brinkius. Flammings & shibid. convex. Contour of distal end a broad arch (like apatorius). (shibid a narrow deep arch - less in Haemobryus & Brinkius)

④ Post. side of flange of stenal end excavated above the facet in a triangular area. Soose flat, flammings a horizontal flange, this general basin, dendrocytus depressed at ext edge. Haemobryus & Apatorius nearest, other shibid excavated also but the marked curvature of the whole end changes the aspect.

⑤ Scap. facet deep & circular closest to apatorius. The shibid & gose also have deep pit it is more oval.

⑥ Foramen present below this facet & slightly in front int. edge of sh. Foramen also visible internally close to edge of ridge extending down from process. Foramen present in Haemobryus & Larus. Absent in Haemobryus & Larus. Present in flammings & shibid.

⑦ Procrasius may have had a slender curved tip. The tip is broken in all specimens, but ~~some specimens~~ ~~to indicate that~~ but the minute point in all specimens is very narrow. Edge which extends down to sh. is stout & round - not a thin lamella as in sh. or sh. or gill. Apatonius broken.

⑧ ~~Furcular facet~~ Head snips slightly antly - (slightly overhang of body of bone here). Furcular facet. ~~demandable~~ ^{as in Hamio} from body below by slight overhang ^{along the edge} & 2 indentations below (ablique ridge between) ^{no indent} suggests geese ^{& this} (sh. birds & gannet with deep excav. below) but Pterodroma is suggestive of the point in an exaggerated way.) Cephalonius with a small bird's projecting one flat surface of body (something like Eurypterus).

⑨ Ant. side of head bears deep gash (lip attach?) ^{same in Apatonius (& by illius, Delthyronus)} This same attach ment in ducks geese & sh. birds is along the out surface of the head (cut. gashed down to center) Pterodroma is more of a gash & more central.)

Coracoid

The coracoid combines characters found in the ibises & geese.

~~Seen from the ventral surface the broadly flared end with~~

The general contour as seen either ventrally or dorsally is similar to Ibis coracoid ~~except~~ But there are a no. of ^{some} details which distinguish ~~the~~ Details agreeable

Other do not:

A = also in Apteryx

Agree

A ① Broadly flared sternal end - ^{some straight process less developed} tapering to narrow body. Sternal - corac process clearly defined

A ② Broad shallow depression above sternal end, dorsal (flat in goose)

A 3. Foramen present (No foramen in goose)

4 @ Sternal facet (dorsally) ^{high} deep & rather squared off at ends. ^{goose similar, but area thicker.}

⑤ Facet curls up onto sternal surface. (In goose this area on vent. surf. is wider than the dorsal. Opposite true of Ph. Fossil has both about equally dev'd.)

dist. by greater in time & dist. of neck.

Don't agree

A ① Deep, large round scapular facet (oral & shallow in Ph) ^{close to goose (no some marginal)}

② Deep cleft on vent side of head. A

3 Foramen set further back from internal edge of foramen & process. slender & process. slender [Can't tell in Ap.]

4 @ Sternal facet as deep ends inside of tip & a thin facet continues on to ext tip. ^{Sternal edge shallower. Some facet at ext tip too important (also in A - even more so)}

⑤ Above scapular facet bone curves inward with marked slope from big facets to head. Head well out to process. This dist would be less marked if there were no large in slanting. [Ap curves over at head but in side of neck not so deep]

A similar as far as is present, but seems to have more facet ventrally at ext. tip

4 no joints.
the same

(6) Head divided off from
back (int. view) by
rough line

(4) Head actually menhays
neck & is convex (int. view)
(Ph flat & concave) (sketch in Ap)

Neck (int. view) excavated
below head, especially
dorsally. Not in Aputan's

Chairs described in ϕ as
unlike Ph are closer to
goose (overhang of head &
dep of neck (int.))

Compared with shorebirds, there is a suggestion that
the *Harelda* cravens could have been derived from this
fossil type but has undergone (a) considerable curvature
of the external end (providing greater rigidity of the shoulder
apparatus & (b) greater excav. of each area (int. surface) under
the head, (c) some also have a marked thrust to the head ventrally,
(d) the furrow has migrated int'lly & disappeared in some,
(e) less flare of external end
Harelda are in-between these relating the
other shorebirds & the fossil. In *Harelda* (a) curvature
is only slight greater than fossil; (b) excav. about same as shorebird;
(c) Tendency to ventral thrust of head but not marked; (d) furrow
present in about same position as fossil (e) about as in
shorebirds.

Apparently important characters
Scapula
lack of dorsal spine (indented edge)
presence of good ventral spine
crossed of coracoid sulci

Humerus

Prox. end:

Deep excavation under median crest & no sign of pneumaticity
(completely gone)
Overhanging head
Deeply cut ligamentary grooves

Distal end

Internally slopes ^{prox} upward so that anterior edge is ^{more prox} higher than the condyle

Both ext & int epicondyles are low (the ext on a line or even lower than ext. condyle) (the ext is slightly higher with long vertical, indented facet (slight runing of surface into center of bone))

Depression small & oval, deeper at internal (distal) edge & runs oblique from just med. to top of ext epicondyle toward ext edge of bone (most prox'ly)

Ulna

Prox

Internal cotyla oval extending slightly oblique from olecranon to internal edge. Lips rise at olecranon & at palmar edge making good depression in this direction. R. Right lat. int. & ext cotylae is well marked delineating the int. cotyla very well

Ext. cotyla & bends down ^{distally} at the palmar edge (at practically a rt $\angle$ & is followed by a good ridge running oblique toward mid of shaft (or even to int. side of sh.))

Two papillae from int. side (below cotyla) slant toward the above ridge & form a part of Δ space.

Olecranon lat. indeterminate but it appears to curve palmar some

~~Cross section of sh. appears quite oval (but present crushing affects high point of sh. is on int. side & crushing may affect~~

Ulna cont'd -

(2)

Dist.

Large lat. process which extends quite high ^{a little above level of} (longest troch)

Contours of trochlea rounded

Capitulum

Proc. M. I. extends almost straight forward from troch. & has slight excrescence at tip (lets see)
Troch well excavated behind. Edges round well back

Proc. on inner side about on level (at bottom) with distal edge of trochlea

Coracoid

Top -

Well formed clav. facet slightly overhanging body of bone
Deep gashed attachment at facets' top & inner edge

Neck somewhat excavated with deep gash along inner edge connecting clav. facet to coracoclav. facet

Deep round cup for ball of scapula

Small foramen below this cup & a small precoracoid process

Acromion

Spreads widely

Scapula

Study bone

Small rather twisted-looking acromion (3rd & 4th groove down back side)
Rounded ball (for socket in coracoid) with oval good facet below.

Bone strongly bowed, large papilla about at apex of bow

Humerus

Trochanter high & seems to bend over prox. facet
Muscle ridge on ant. side hits troch. just below base of

Dist.

Large papilla with a pit in it above fibular troch.
Muscle line up from edge of ant. condyle obliquely & mid sh.

Characters which Milne Edwards
says distinguish certain orders

Scapula in "Totanides"

Behind the scapular head (which is only slightly developed,
hardly passing the little head of the coracoid) is limited
by a small ledge not present in Samelliroste
Troglodytes or Platyrrhini

Coracoid

- not always seen
- 1 on int. side of body of shaft - a longitudinal furrow
 - 2 Sternal facet occupies entire extent of inferior border
 - 3 Coracoid tuberosity prolonged. Oxypterus less than three
(Oxypterus also has a process as in gulls)

Humerus -
Totanides all have a "sub-bicipital furrow"

2 3 4
17 18
4

milne Edward

Ciconides

Quinacridone
dye - Radial process
longer - Radial process
higher up -

Onelacarpus -

Distinguished from other birds by long connection of

The 2 parts (M 3 & 4)

Throats not very deep and edges only slightly produced

No iterative process in ducts etc

Pisiform process rounded & prominent

Radial process divided up & forward

Quinacridone

tail
No X

90

9

9

3

13

44

Parides

Humerus - Body of bone nearly straight, not arched inside as in the *Samellirostes*, not curved behind as in the *Totipalmatus* & *donr*.

Trochanteric process more raised than in ducks
head is on a very short neck, & directed inward

No pneumatic foramina

Intermuscular line extends on body of bone up to
superior extremity without running into
the ant. edge of the trochanter as it does
in the ducks

Intercondy. gorge narrow

★ Ulna - forearm surpasses the humerus in length - markedly
Humerus of *Parides* & *Procellariidae* differ from all other birds, ^{except *Totipalmatus*} in the

marked, pointed suprapiccondylar process

Ulna - humeral end slightly compressed anteriorly

Surface of attachment of short flexor of forearm is slightly
depressed & very elongated.

Metacarpus - no interarticular groove on carpal tubercle
Higher from *Totipalmatus*: in slight depth of depression in front
of pit on process.

Space bet. metacarpals fairly large.

Radial process pointed up a bit

Pisiform closer to articulation of humerus than in *Procellariidae*

Characteristics of Birds cont'd

Shorter wing than *Saunders*

Forearm always longer than humerus, hand well developed & its length often surpasses that of humerus; therefore it is less.

Humerus

Shorter relative to girth than in *Saunders* / *Saunders* have more rapid & sustained flight & humerus shows vigor in the muscle insertions being better in diameter & the processes more projecting, the grooves deeper.

High ext.-epicond. proc. (ext. of hand) less dev'd than *Saunders*

Character of Anser Jones

Tibia Anser

Body of bone straight & generally becoming thinner a little above the tendinal bridge, from here the articular end curves on the inside in such a manner that the internal condyle greatly exceeds the corresponding ^{surface} of the ~~body of the bone~~ ^{condyle} & makes a considerable projection, while the ext. condyle on the contrary finds itself situated a little on the inside of the surface situated above the ant. edge of the int. condyle is ~~thinner~~ & more projecting than the ext. The trough of the extensor of the foot is very deep. The little groove for the short peroneal muscle is situated ant. on the ext. edge, immediately above the corresponding condyle. The body of the bone is rounded behind & laterally, but in front is more or less flat.

Femur

The popliteal cavity is very marked, so as to permit the immediate recognition of the femur of the Anser from that of several other ^{species} ^{which} ^{by} reason of the obliquity of the distal articular extremity might otherwise be confused with the preceding.

The superior end is large & thick, the femoral head is small, the neck which supports it is larger. The distal end is very thick & little elevated in such manner that its superior edge is placed ^{nearly} ~~a little~~ ^{at} the same level as the head & is continuous with it by a large articular surface. A line passing by the sup. edge of these two projections forms almost a straight angle with the axis of the bone, which direction varies from 91 - to 96 degrees.

Scapula

The coracoid sulci do not cross each other on the median line. Often even they are separated, at this point by a little depressed space in front of which sometimes exists an episternal process slight projection.

The coracoid facets are very projections. # from 6 to 8. The upper body of the plate is very wide & in general has only one large ^{pyramidal} ^{reflex} situated in front on the median line.

Coracoid - Not very strongly united to sternum, which is due in part to the slight depth of the coracoidal sulcus of the sternum.

① Post. part large - hyposternal part very developed, the process of the same name which forms the superior angle is very small but generally pointed.

② The sternal facet, very large ^{on the} inside becomes thin to the outside

③ Subclavicular process moderately developed but diverges ~~constantly~~ a recurved crook above & in part,

④ usually there is no subclavicular trough

⑤ The scapular facet is large & deep.

⑥ The neck of the tuberosity is long & somewhat slim.

⑦ The tuberosity is small & often crossed below & inside by a more or less deep cavity.

★ In the *Anthracoceros* the sternal extremity is ~~relatively~~ more enlarged than in the ordinary ducks, the hyposternal process more projective & the sternal facet more developed.

Anas melanoleuca alone has a well developed sub-claw process.

Himantopus

The pneumatic foramen is enormous & blends with the subtrochanteric foramen in a manner to give the latter a great depth.

There is no epitrochanteric foramen above the humeral head.

from Miles Edward

Avesiformes

Tarsus -

- ① Short - robust, cylindrical body; post. face convex transversely, no post. metatarsal groove (of the kind found in many other birds)
- ② Heel very large, occupies nearly all transverse diam. of bone. 4 crests - int. most prominent & longest; others diminish progressively. int. groove forms a tubular canal by suture of edges of crests & on post. face of this suture is an accessory groove; ext. groove opened wider than median.
- ③ Trochlear well-developed; - middle one long & robust ext. a little less prolonged than the middle; int. strongly curved backward is smaller than ext. & hardly descends to the base of the mid. troch.

Belgian forms differ in direction of neck which projects more obliquely upward & by the lesser breadth & depth of the ant. intercondylar process split from rudimentary

split (posterior base of bone) fossa, wide & well marked (distinguished from other avian forms)

Head small, neck large & stubby

Trochanter thick & only a little elevated so that its superior border is placed nearly at the same level as the head & is continuous with it by a large articular surface

Genus

Coracoid sulci do not cross & are often separated by a small depressed space & part of which there is sometimes an episternal process

Coracoid

Not very firmly united to scapula which depends in part on the shallowness of the articular sulci

Sternal part very large inside is very thin outside

Supracoracoid process is moderately developed but always forms a second fork (crochet) curved above & before (except in swan)

Scapular fossa deep & large

Forearm larger than
humerus in females

ulna - radius near the length of humerus or a little shorter
Radial inc. process on ulna is short & limited width
by a little crest.

Olecranon process strongly elevated & directed inward above
the int. glenoidal facet

The radial depression is generally only slightly marked.
Inferior end relatively large; slightly compressed laterally
& surrounded with a protruding carpal tubercle;
outside it presents towards the superior part a rather
deep groove bordered by a little crest in which
attaches the flexor tendon of the phalangeal hand

Metacarpus -

Distinguished by the feeble separation of the parallelism of the 2 bands
Tubercles particularly characteristic
Inferior crest very protruding behind & uninterrupted by
any grooves

The extensor is only slightly protruding & posteriorly has
a characteristic depression

Pisiform process is very far from the superior edge
of the carpal tubercles. It raises itself much
above the tendonal attachment of the flexor muscle.
Intermetacarpal unguit is roughened but doesn't form any
appreciable process. It is situated on the large metacarp.
at the pt of separation of the little branch

Radial process directed straight forward

Intermetacarpal unguit also elongated
in the olecranon
only a trace of an intermetacarpal groove
in int. crest in olecranon process
Radial process strong & pointed upon
olecranon.

Character of *Palaeolodus ambiguus*

Humerus (pl 83 fig 1-2, pl 82 (int))

Strongly compressed laterally in a way that its out-face is very narrow (étroit), the lateral faces deep (larges) & the post. face still more compressed (resserrée) than the ant. ^{rather} resembles a rounded edge. There is no ant. meta-tarsal groove as in the flamingoes, the 2 insertions of the tibialis anticus are very little separated from each other & often they appear to blend. The ext. is much larger than the internal; the depression which they surround is broad & deep & the foramina which are ^{considerable} ~~somewhat~~ open there.

In comparison of the oses, *Palaeolodus* is far removed from all other waders. In fact, in the ~~storks~~ flamingoes there exists only one large groove. Not only are the lateral aerts very strong but there are 2 accessory aerts which subdivide the space which is left free in the flamingoes; in this way there are 3 tubular grooves of which 1 (the largest) is situated at the base of the internal aert, the 2

Humerus -

The sub-trochanteric fossa is superficial & goes deep into percent there any large pneumatic orifices but one sees several very small foramina across the thin lamella of osseous tissue which exists on this point

from Milne-Edwards

Character of Sh birds "Totanides"

Tarsus long & slender not thrust - some more robust & shorter
heel usually little developed
with trochlea thrust back & its post-ext edge is prolonged behind
in the form of a tubercle instead of remaining thin
Median trochlea is the longest of all,
~~trochlea~~ is much reduced or absent

Tibia

Not always possible to distinguish from *Larus*
int. condyle more compressed & less high than the ext. & more forward
more flattened distally than in the gulls & behind the external
condyle has a little depression,

Femur

Neck narrowed than in *Larus*

Rotula gyl (ant) less deep " " "

~~No fossa in femur, superior, in this~~

Proximal process limited in front by a kind of crest which is
continuous with the int. edge of the bone,

Trochanter very elevated

Scapula

Angle of keel rounded (not recurved as in gulls, ~~ext~~ forward &
upward to lean against the pectorals

4 ~~small~~ ~~glenoid~~ indentations

Coracoid sulci less deep than in *Larus*

Coracoid

Short, robust & nearly straight

Glenoid edge occupies entire extent of inferior border
~~Glenoid edge~~, less elongated (than *Larus*) & on a more arched transverse
line. Ordinarily it is enlarged on its median part or outside which
in gulls is dilated mostly behind.

The hyposternal process is more elevated than in gulls
on internal side, Body of bone has a deep longitudinal furrow

for tendon of least pectoral

Intermuscular line is only slightly marked & often completely disappears

Coracoid tub. prolonged behind to furnish a large surface of insertion
to the episternus-coracoid lig.

This tubercle is only rarely crossed with a cord (deep fossa in *Larus*)

Oxytarsus nearest to *Larus* - has foramen under
processus, less arched at base & a fossa on the cora. tubercle

Scapula - "abone that differs very little in different groups of birds"

Gradually enlarged (not dilated suddenly in front) glenoid facet
oval & directed forward to artic. The scapular tub. is slightly
developed & hardly passes the little head of the coracoidium. Behind
it is limited by a little projection not present in *Amellicorax*,
Tubercles or processes,

Scapula - form of ant. process,
hyposternal process & process
of foramen distinguish from
other water birds (except birds)

Check
Oxytarsus
coracoid

Family Paloelodidae

Diagnostic Characters (selected from Milne-Edwards, 1867-1871, vol. 1, pls. 82-89 and vol. 2, pp. 58-82): Distinguished from the Phoenicopteridae by (1) tarsometatarsus relatively short with shaft deeper than broad and with hypotarsus made up of more than two crests; (2) distal end of tibiotarsus more asymmetrical with less extent of condyles posteriorly and with less complicated development of tubercles adjacent to supratendinal bridge; (3) femur lacking pneumatic foramina, and trochanter relatively low; (4) furcula with large fossa in symphysis, perforated with pneumatic openings.

Family Telmabatidae

Similar to the Paloelodidae as distinct from the Phoenicopteridae in characters (1) & (2) above; distinguished from both the Paloelodidae and the Phoenicopteridae as follows:

Diagnostic Characters: Posterior thoracic vertebrae not heteroscoelous; synsacrum not fused with pelvis, but articulating, at least anteriorly, by means of broad facets; subtrochanteric fossa of humerus devoid of complex laminations or foramina; external crest of trochlea of carpometacarpus better developed than internal crest.

SUMMARY AND CONCLUSIONS

Four species of birds are represented by ninety-three bones from a fossil pocket of the Casamayor Formation in Chubut Territory, Argentina. Three species are represented by a single fragment each, and none of which is assigned. ~~(Telmabates minor, new species).~~ The fourth, and most abundant species, is herein described as Telmabates antiquus. This species, represented by ninety bones, is a primitive wader similar in many respects to the flamingo-like Paloelodus of the European Tertiary, but even more primitive. It is

Compared with Paloelodus, Telmabates is slightly shorter than *P. ambiguus*, longer than in *P. gracipiles*; it lacks the strong distal tubercle, seen in *P. ambiguus* (pl. 85, fig. 10-11). ^{similar to that of Paloelodus the latter}
Wing phalanx.-- Both wing phalanges (type and assigned specimen ^{practically} no. 4180) are phalanx 1 of digit 2. Specimen no. 4180 is complete and is similar to the corresponding element in the Roseate Spoonbill and the ibises. The type ~~xxxxxx~~ is incomplete but appears to resemble no. 4180 in all respects. Measurements: Type (3170), Length, type (3180) 30.4 mm.; no. 4180 29.6 mm.; greatest depth, no. 4180, 8.5 mm.

Pedal phalanges.-- A single badly eroded pedal phalanx in the type (3170) represents digit 2, phalanx 1. The cotype material includes proximal fragments of the first phalanx of digits 2 and 3, and 2nd phalanx of the latter; the fourth specimen of the cotype cannot be readily placed; it is only slightly less in length than phalanx 2, digit 3, with a distal end suggesting articulation with the ungual. Specimen no. 429 is a nearly complete phalanx 1 of digit 3. These fossil phalanges are all very similar to the corresponding elements in the Phoenicopterus, except for the fourth specimen in the cotype, ~~which~~ ^{the} ~~does not agree with~~ placing of which is uncertain. Regarding in *P. ambiguus* Paloelodus, Milne-Edwards (1867-68, p. 63 states that/the phalanges ~~are~~ show the characteristics of the flamingos except that they are and his illustrations show that the first phalanges of more strongly compressed, ~~and all digits are it is~~ relatively longer. ^{pe 82/44}
Strong lateral compression is not noted in Telmabates; phalanx 1 of digit 3 is shorter than in Paloelodus and in proportion to breadth similar to that of Phoenicopterus; phalanx 1 of digit 2 is incomplete; phalanx 2 of digit 2, however, is equal in length to the corresponding element in Phoenicopterus and slightly longer than in Paloelodus ambiguus.

omitted in final version
Telmabates minor, new species

Type: A.M.N.H. No. 3189, a distal end of right tibiotalar.

Horizon and Locality: Same as for Telmabates antiquus.

Specific Diagnosis: Similar to Telmabates antiquus except as follows: (1) Groove for peroneus profundus placed higher on shaft -- above level of supratendinal bridge, and above ridge which, in T. antiquus, forms anterior border of groove; (2) small perforation at base of above-mentioned ridge, externally; (3) anteroposterior depth slightly greater than transverse breadth (in T. antiquus the transverse measurement is greater); (4) swelling at external edge of supratendinal bridge more developed; (5) size of bone 20 per cent smaller than in T. antiquus. Breadth across distal condyles, 9.5 mm., depth of condyles, 9.6 mm.

Systematic Position of ~~Bracheabates~~

^{ideal} (~~Telmabatidae~~
as published)

Although relationship of the Bracheabatidae to the Phoenicopteridae is clearly indicated, the placing of the fossil family in its proper ordinal position requires some consideration. Several basic questions are involved:

Is the family Phoenicopteridae (with related fossil families

1. ~~Is~~ ~~Phoenicopteridae~~ correctly allocated to the Order Ciconiiformes?

2. Is the family Apatornithidae correctly assigned to the Ichthyornithiformes?

3. Are the characters of Bracheabates sufficiently primitive to indicate an ancestral group from which a number of present day water birds have been derived?

1. The Flamingoes have had a long history of indecision regarding their proper ordinal position. Huxley (1867, p. 460) believed them to be intermediate between the anserines and the heron-stork group and assigned them separately therefore (a subordinal allocation in view of his grouping of all desmognathous birds into one order). ~~Coues~~ Coues (1903, vol 2. pp. 887-888) also recognized the intermediate position of the flamingoes, but chose to place them as a suborder of the anserine group. Today the accepted position is that of a suborder within the Ciconiiformes. In view of the many fossil forms which are now recognized as related to the flamingoes, it is evident that a group is represented whose members could be numbered among the dominant water birds of the past. The fossil forms ~~xxxxxxx~~ ^{can not all have been} ~~xxxxxxx~~ evolutionary stages in the development of the flamingo of today, ~~xxxxxxx~~ for a true recognizable Phoenicopteridae occurred contemporaneously with the very abundant Palaeolodius of Oligocene time.

^{key characters}
and appears to be a more primitive type. I do not believe that
^{it can be placed in the family Phoenicopteridae.} (4)
it is still removed from that family, as it does not bear as close

resemblance to the modern flamingoes as does *Palaeolodus*. It is there-
fore necessary to erect a new family for the South American bird, as
follows:

^{is there here erected}
^{Later Talmababidae}
Bracheabatidae, new family

Type genus: *Bracheabates*,

Primitive wading birds affiliated with the *Phoenicopteridae* but
more primitive in structure; lacking extremes of specialization, par-
ticularly of the tibiotarsus and tarsometatarsus, noted in that fam-
ily. Detailed characters as of the type genus and species,

^{Talmababidae to wing bones}
Bracheabates, new genus

Type: *Bracheabates antiquus*,

Characters: Coracoid short, but slender; coracoidal sulci of
sternum crossed; lacrymals not coossified with frontals; last three
thoracic vertebrae amphicoelous or opisthocoelus, 4th from last hetero-
scelous anteriorly only; fossa below median crest in humerus well ex-
cavated but completely devoid of pneumatic foramina; entepicondyle of
distal end of humerus receding proximally and anconally from ulnar con-
dyle; external crest of trochlea of carpometacarpus as well developed
posteriorly as the internal; ~~internal condyle of tibiotarsus thrust~~
~~internally away from shaft; external condyle of tibiotarsus shorter~~
~~but higher (more round than internal; very slight indication of tuber-~~
~~side of distal supra~~
cle at external/edge of of/tendinal bridge; ^{in tibiotarsus} acromion of scapula well
developed beyond level of facet,

^{Talmababates}
Bracheabates antiquus, new species

Type specimen: American Museum of Nat. Hist. no. 310 consisting
of the following elements found associated -- (insert list).

Cotype specimen: Amer. Mus. of Nat. Hist. no. 434 consisting of
the following elements found associated -- (insert list).

Locality: Green bentonite facies in Casamayor Formation, Canadon
Hondo near Paso Niemann south of ^{the} Rio Chico del Chubut, southern Chubut
Territory, Argentina.

As a matter of fact, however, the very abundance of the material has contributed to the delay in assigning it. On first inspection, one element seemed to point toward one line of relationship while another suggested a different allocation. Only after considerable study and weighing of evidence ^{derived from both the form & fossil form} has it been possible to ^{reach} form a conclusion complete picture. Following is a review of some of the ordinal and family affinities suggested by the different elements.

→ The small fragment of skull is closest to the flamingoes and ibises.

~~det~~ The sternum, ~~coracoid~~ and scapula combine characters of the flamingoes with those of the swans and geese. ^{The same is true of the coracoid, with the addition of the ibises, and in some characters to} The humerus, though distinctive in certain respects, resembles several of the ciconiiforms, but particularly the flamingo, and in one respect approaches the swan, ^{in others to some of the ducks & geese.}

The ulna is most like the Burrhinidae, but is not entirely unlike the flamingo.

The radius is distinctive, but is nearer the flamingo than than any other group.

The carpometacarpus is very distinct in one important character, but in others resembles the geese, and in part the flamingo.

The tibiotarsus is totally unlike the flamingo, and suggests a compromise between an ibis and a goose.

The femur is ~~totally~~ unlike any anseriform bird and has similarities to certain charadriiforms, and to the flamingo.

It may be noted that the ^{Phoenicostepus} flamingo is most often mentioned, ^{with some reference to other ciconiiforms} with the anseriforms ^{as next in line} next, and an occasional resemblance to the Charadriiforms. ^{occurs} I believe this latter group can be disregarded, however, for there are certain markedly characteristic structures of that group which are totally unlike the fossil. The few similarities probably represent parallelisms, ^{as in the case of the vertebrae, a hold over of a primitive condition.}

Diagnosis.-- Lacrymals not fused with frontals; last three ~~thoracic~~^{vertebrae} amphicoelous or opisthocoelus, 4th from last heteroscelus anteriorly only; coracoidal sulci of sternum slightly crossed; coracoid ^{relatively} short, but slender; fossa below median crest in humerus well excavated but ~~completely~~ devoid of pneumatic foramina; entepicondyle of distal end of humerus receding proximally and anconally from ulnar condyle; external crest of trochlea of carpometacarpus equal in development to internal; acromion of scapula well developed beyond level of coracoidal facet; very slight indication of tubercle at external side of distal ~~edge~~^{well-formed} of/supratendinal bridge in tibiotarsus.

Bracheabates antiquus, new species

Type specimen: American Museum of Natural History no. 310, consisting of the following elements found associated

Cotype specimen: Amer. Mus. Nat. Hist. no. 434 consisting of the following elements found associated

Assigned material: Amer. Mus. Nat. Hist. nos. consisting of miscellaneous elements, some associated, and representing at least 8 individuals.

Locality and Age: Green bentonite facies in Casamayor Formation, Lower Eocene; Canadon Hondo near Paso Niemann south of the Rio Chico del Chubut, southern Chubut Territory (Patagonia), Argentina.

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- ✓ 1938. ^b A new marsupial from the Eocene of Patagonia. Amer. Mus. Nov. no. 989, 5 pp. (May 24, 1938), 1 fig.
1940. Review of the mammal-bearing Tertiary of South America. Proc. Amer. Phil. Soc., 83(5):649-709, 4 figs., 11 charts. (Oct., 1940)
1941. The Eocene of Patagonia. Amer. Mus. Nov. no. 1120, 15pp. (June 9)
1948. The beginning of the Age of Mammals in South America. Bull. Amer. Mus. Nat. Hist. 91 (1):1-232, 80 text figs., 19 pls. (July 15, 1948)

Loomis, Frederic B.

1914. The Desado Formation of Patagonia. Amherst College, 232 pp., 160 figs.

Marsh, Othniel Charles,

1880. Odontornithes: a monograph on the Extinct Toothed Birds of North America. Prof. papers Eng. dept. U.S. Army, report of geological exploration of the ~~34 pls. 40 woodcuts~~ ^{34 pls. 40 woodcuts} for the parallel ^{vol. 1} x + 201 pp. 34 pls. 40 woodcuts

$$\begin{array}{r} 95 \overline{) 121} \\ 95 \\ \hline 260 \\ 190 \\ \hline 700 \end{array}$$

$$\begin{array}{r} 121 \overline{) 958} \\ 968 \\ \hline \end{array}$$

$$\begin{array}{l} 12.1 - 9.5 = 2.6 \\ 9.5 \times 12.1 = 114.95 \\ \times 2 = 229.9 \end{array}$$

Copied
Simpson, G.G.

1937. New reptiles from the Eocene of South America. Amer. Mus. Novitates no. 927, 3 pp.
n.g. & sp. (*Sebecus icaeorhinus*, remotely corcodile-like)
X " (*Crossochelys corniger*, turtle)
1938. A new marsupial from the Eocene of Patagonia.
Amer. Mus. Novitates no. 989, 5 pp., 1 fig.
(*Coona pattersoni* n.g. & sp.) small didelphid

Schaeffer, Bobb

1949. Anurans from the early Tertiary of Patagonia.
Bull. Amer. Mus. Nat. Hist. 93(2): 45-68, (refer to pp. 49)
7 figs.

Colbert, Edwin Harris

1946. *Sebecus*, representative of a peculiar suborder of fossil Crocodilia from Patagonia. Bull. Amer. Mus. Nat. Hist., 87(4): 221-270, 30 figs.

Mayr & Amadon

1951. A classification of recent birds.
Amer. Mus. Novitates no. 1496, 42 pp.
(April 2, 1951)

Milne-Edwards.

1867-1868

(pls 82-89)

Measurements

Ht of carina from dorsal lip of sulcus	38.5	city W ³¹⁸¹ 434
Length of coracoid	43.8 42.3	(434) 3181 (436) 3183
Length of humerus	140.8	(type) 3170 (310)
Ulna length est.	140 +	3170
Rad - "	130 +	3170
Carpometacarp.	63.1	3166
Scapula	? 69-72 mm?	3170
Tarsus	105 mm?	3181

$$\begin{array}{r}
 69 \quad 72 \\
 35 \quad 36 \\
 \hline
 104 \quad 108
 \end{array}$$

THE AMERICAN MUSEUM OF NATURAL HISTORY
CENTRAL PARK WEST AT 79TH STREET
NEW YORK 24, N. Y.

DEPARTMENT OF GEOLOGY AND PALEONTOLOGY
GEORGE GAYLORD SIMPSON, Chairman

GEORGE GAYLORD SIMPSON, Ph.D., Sc.D., LL.D., Curator of Fossil Mammals and Birds
EDWIN H. COLBERT, Ph.D., Curator of Fossil Reptiles and Amphibians
NORMAN D. NEWELL, Ph.D., Curator of Historical Geology and Fossil Invertebrates
BRIAN H. MASON, Ph.D., Curator of Physical Geology and Mineralogy
OTTO H. HAAS, Ph.D., LL.D., Associate Curator of Fossil Invertebrates
BOBB SCHAEFFER, Ph.D., Associate Curator of Fossil Fishes
RACHEL HUSBAND NICHOLS, A. M., Scientific Assistant

BARNUM BROWN, Sc.D., Curator Emeritus of Fossil Reptiles
CHARLES C. MOOK, Ph.D., Associate Curator Emeritus of Fossil Reptiles
HORACE ELMER WOOD, 2nd, Ph.D., Research Associate in Fossil Mammals
LOUIS HUSSAKOF, Ph.D., Research Associate in Fossil Fishes

14 May 1954

Dr. Hildegarde Howard
Los Angeles County Museum
Exposition Park
Los Angeles 7, California

Dear Hildegarde:

I enclose herewith replies to your questions from Miss Tyler, our Editor. Her suggestions are meticulous as always.

She also suggests that if your manuscript is as long as 75 pages publication in the Bulletin might be considered, and adds that if publication were to be in the Bulletin her answers to all these questions would be quite different! I gather, however, that the manuscript is more of Novitates length.

It is extremely unlikely that I will get to the G. S. A. meeting next November because I think I will probably be in South America at that time. I will probably get to Los Angeles sometime during the summer, but I will be very hurried and must spend my time mainly if not entirely visiting my mother who, perhaps understandably, has become rather demanding in this respect. However I may be able to get over to the Museum some time.

With cordial regards,

Sincerely,

George

George Gaylord Simpson

GGS:mbp

Enclosures

THE AMERICAN MUSEUM OF NATURAL HISTORY

CENTRAL PARK WEST AT 79TH STREET

NEW YORK 24, N. Y.

May 12, 1954

ANSWERS TO QUESTIONS IN LETTER HOWARD TO SIMPSON, 5/5/54

1. Yes; but see answer to 3, paragraph a, below.

2. Question 1: Each object, or each aspect of one object, should have an individual reference number or letter.

2. Question 2: The reference numbers or letters should invariably be strictly sequential in the legend, which in the case of example A (labeled, by me in red) means use of the legend marked, in red, 1. This makes a legend to the figure long and seemingly needlessly repetitious, but the alternative here suggested (numbered, in red, 2) of one letter for two or more views of the same object, with the grouping indicated by wider or narrower space between the photographs, is not nearly so precise. It throws a degree of interpretation, admittedly small, onto the reader. "Figure 1A, palatal view" as a reference in the text (the choice being between two or more illustrations) is reader's choice and not so good as "figure 1B" which is the palatal view and is the author's statement of fact.

3. The answer to this question depends on an author's wishes:

a. If an author wants to have an illustration of an object placed in, or as near as possible, the discussion of it in the text, then of course the objects should be separate figures and separate engravings. A caution here is that, if absolute scale is involved (e.g., if every object must be reduced to one-half of its size as photographed to being, let us say, all to one-fourth natural size) or if the lettering on the original photographs is all of the same size, then each photograph must be reduced in the same ratio as that of the largest. This, I know, is obvious, but I mention it as a reminder, because authors often forget it and are chagrined to find an engraving an inch wide which they had expected to be of page width.

b. If a is not so, it is more economical to assemble small units, as Dr. Howard has done, as one layout which will fill:

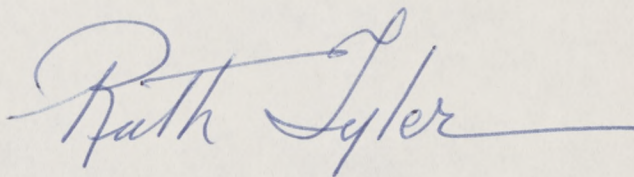
1. With its legend, one full page, or

2. At least the full width of page. The waste is, in small engravings, in the horizontal dimension; the vertical dimension, if the engraving is short, can, and must necessarily, be filled to page height with text.

3. Paragraph 2: Because this miscellaneous group, as sketched, has a legend shorter than the one for example A, the engraving could be a little wider (see pencil notes beneath the sketch). Furthermore, the legend need not be so long as it is; I have typed a revision at the bottom of the page. I wish to go back to "2. Question 2" first sentence above. That holds, but beyond that one cannot make arbitrary rules about

the composition of a legend. Legend 1 in example A cannot be significantly shortened, but that in example B can be, as indicated in my revision. Anything common to the whole can be put in the "supercaption" (in example B the type and specimen number as well as the specific name, etc.).

I have taken the liberty of editing legend 1 in example A a little and measuring off the vertical dimensions for the page. If, as presented, the engraving and legend measure no more than one-eighth of an inch over the length of page, the running head can be omitted and drop folio (page number) used. It is a nicely calculated page, but will bear not a fraction more in the vertical dimension.

A handwritten signature in blue ink, reading "Rath Tyler". The signature is fluid and cursive, with a long horizontal line extending from the end of the name.

Editor, Scientific Publications

B



#

Fig. 5. Telmabates antiquus, new species.

Radii and ulnae. A, ~~and~~ B. Palmar and anconal views, ~~of~~ right radius (section of shaft missing between proximal and distal portions), ~~Type~~, A.M.N.H. No. 3170. C, ~~and~~ D. Palmar and internal views, right ulna (proximal end), ~~Type~~, A.M.N.H. No. 3170. E, ~~and~~ F. Palmar and ulnar views, left ulna (distal end), ~~Type~~, A.M.N.H. No. 3170.

335 char -

OR

Using red letters, single letter for both views of the same specimen.

Fig. 5. Telmabates antiquus, new species. Radii and ulnae of the type, A.M.N.H. No. 3170. A, B. Palmar and anconal views, right radius (section of shaft missing between proximal and distal portions). C, D. Palmar and internal views, right ulna (proximal end). E, F. Palmar and ulnar views, left ulna (distal end).

313 char.

$3\frac{1}{4} \times 5\frac{1}{2}$ " could be
 $3\frac{1}{2} \times 6$ ", if legend is
 no longer than 1 on this sheet.

~~X~~ running head



1/2 pica

Fig. 7.

etc.

43
picas =
page
length
over
all

#

Fig. 7. Telmabates antiquus, new species.
Tarsometatarsi and tibiotarsi. A, and B.
Posterior and anterior views, right tarso-
metatarsus (distal end), A.M.N.H. No. 3171.
C, and D. Anterior and posterior views,
fragment of left tarsometatarsus (middle
and inner distal trochleae), Type, A.M.N.H.
No. 3170. E, F, and G. Internal, posterior
and anterior views, left tibiotarsus (distal
end), A.M.N.H. No. 3180. H, I, and J.
Internal, posterior, and anterior views,
left tibiotarsus (distal end), Type,
A.M.N.H. No. 3170. K, and L. Anterior and
posterior views, right tarsometatarsus
(proximal portion, badly crushed and dis-
torted), A.M.N.H. No. 3181. 620 char.

1 1/8" - 1 3/8"

①

OR

Combine letters pertaining to the same specimen
i.e. A and B. would become A; C and D, become B;
etc. The single letter pertaining to several
views of one bone to be placed at left of first
view. There will have to be dividing lines between
the views, but those pertaining to one specimen
could be blocked more closely together, with larger
space between "blocks".

②

no

raise object just a
trifle

May 5, 1954

Dr. G. G. Simpson
American Museum of Natural History
New York, New York

Dear George:

I am working on the make up of the figures for the manuscript on the Patagonian bird. Since the instructions regarding make up of plates and figures are so inflexible, I feel that I should clarify a few points before proceeding.

1. Am I right in assuming that the figures for the Novitates can be any size and of any proportions under the maximum indicated in the instructions and can be scattered through the text in the appropriate places?
2. In lettering the individual photographs which will make up the figure, is it better to use a single letter for all views of the same bone, or should each view receive a separate letter? If the latter is the case, can the letters pertaining to one specimen be grouped in the legend, or must the instructions be precisely adhered to and full data on each individual photo be presented letter by letter?

Kindly see enclosed two sketches of tentative figure make-ups with proposed legends.

3. Is it advisable to place more than one element in one figure, as I have done in the two enclosed sketches, or would it be preferable to confine a figure to a single element even if it makes a rather long, narrow figure (as would be the case if I separated the radii and the ulnae into two separate figures).

One of my figures, as now planned, would have five different elements--a sort of miscellaneous group, gathering together all the miscellany such as sternal fragments, phalanges, vertebrae synsacrum and skull fragment.

Perhaps you could pass these questions on to the Editorial Staff for reply.

Dr. G. G. Simpson

-2-

May 5, 1954

As you see, I am going ahead on the assumption that this paper best fits the Novitates. I do hope the photographs will show up in half-tones. The bones are so mottled in color and some are so distorted that the preparation of the illustrations has been very difficult.

Any chance of seeing you this summer? Certainly next November?

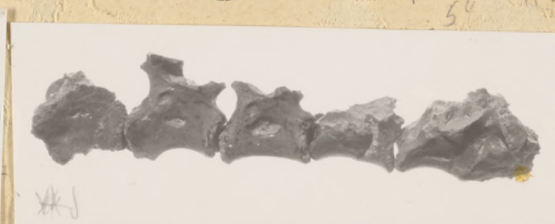
With best wishes,

Sincerely,

Hildegarde Howard
Chief Curator
Division of Science

HH:bs

Enc.



54.123 F →

this one →
may be
placed
below these 2

or
(see
other side)

← 54.113. B

← 54.113. J

← 54.123 E

or
these 3 may be
placed below
these 2

54.113.K

54.113.A

54.113.A

also
specimen
54.123.F

54.113. R

①

to send
A B C D etc

A B C D

place these 2
together before
the other 2

fig 6

123.F

would it look
better balanced
to put the
bottom row
at the top?



A B C D

fig 3



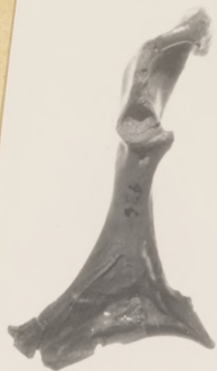
3170

Leit fber

54,113 - J

Can you give
this upper edge
a more distinct line?

Can #1's
be bones
meant
fig. 1 also



b

c



d

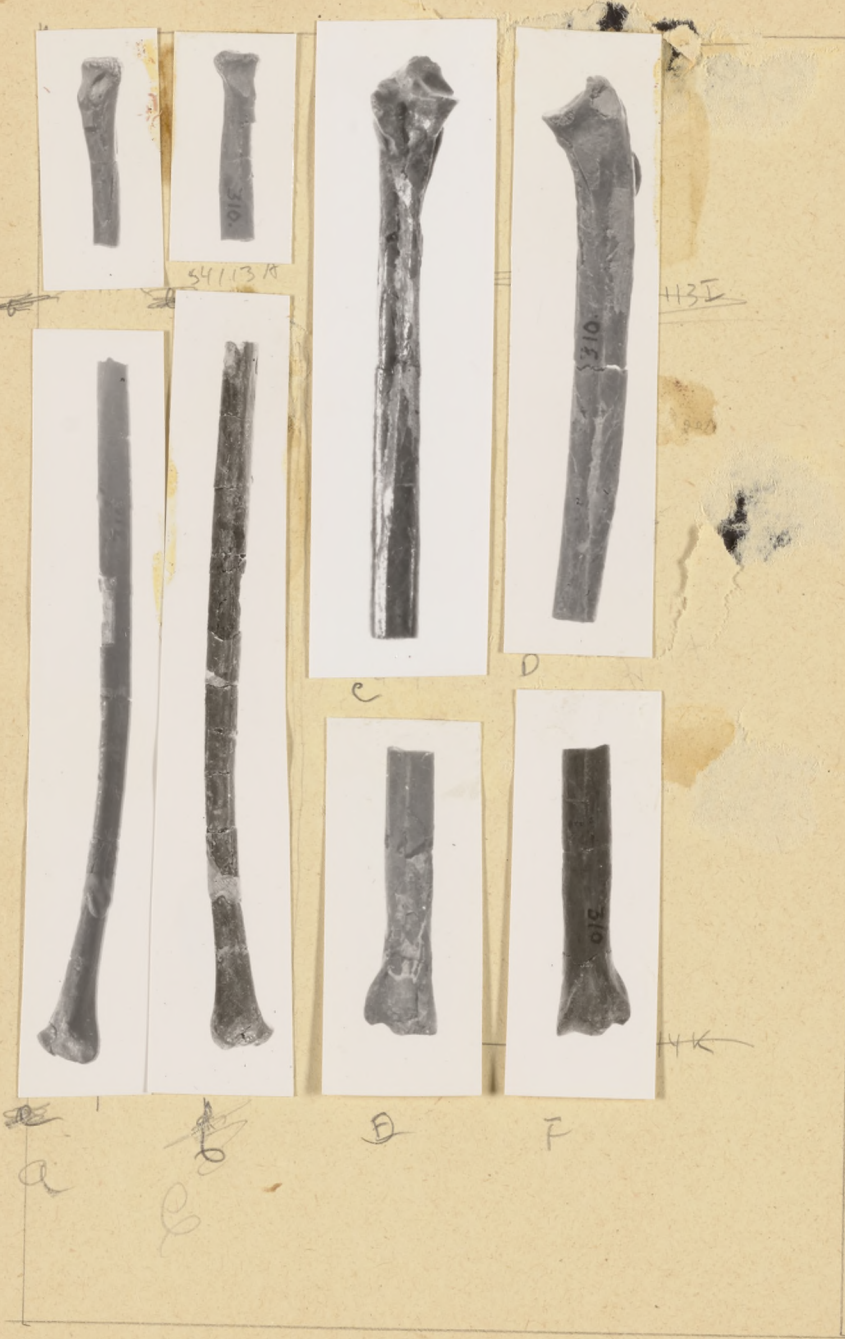
e

f

~~2~~ 2



4



visit

~~add Apatous~~

5/5

straighten →



54.114.L

54.123.C

54.113.B

54.114.L

54.114.L
~~54.114.B~~

~~P1D3 3174~~

→ 54.123.F

~~3181~~

B 54.113.J

54.123.C
uncured

~~54.113.J~~

~~54.113.B~~

~~54.113.B~~

~~54.113~~

113.A

② 67

The forchamber is broken in the type
but in AMNH no. 3169 is preserved the

54.113.7

54.123.0

54.114.L

54.114.F

54,114.5

54, 114, II

54.114.F

54,113. J

54.113, I

54.114.6

~~2 large ants~~
~~2 small ones~~

apparent ^{lack of} difference in thrust in ^{figured} type ~~and~~ figs
no. 380 (fig 86) is due to angle of photo and aberration of
internal ~~displacement~~ ~~border~~.

Brachiacola

Senagocola

Brachcabates

Bracheabafidae

Brachyabatifornis.

Brachabates antiquas

Telma = pond or swamp

telmabates = one who goes in or
haunts
the ponds.

Helicobatoridae

29 Helmafalis

Telmator

22

22

22

かゝ

98

98

78

Φοιτάω } frequent
Θαμίζω }

Thamizaktios

~~Phoetabrachus~~

frequent

ὀμιλέω - homileotenagus

homileobrachus

~~hile~~

Thamizotenagus

Thamizobrachus

Phoetaotenagus

Ethobrachea

Ethobracheidas

Ethobracheiformes

Tenagoderfms

Tenagornis thifms

Type
Amer. Mus.
Nat. Hist. No.
310. Co. type #434

~~Intal~~ ~~new~~ ^{Telmahafes}
Brashea bates antiquus (Brashea = shallows; Bates
= one that goes or walks; antiquus = ancient)

used at
COC
1950

AN ANCIENT AND POSSIBLY ANCESTRAL WADER FROM PATAGONIA

Telma =
pond or swamp
Telmahafes
one who
haunts the
ponds.

In my studies of fossil birds over a period of years, I have worked largely with California material, most of which is not very ancient from the geologic point of view. The Rancho La Brea fossils, of Pleistocene age, for example, date back only forty to fifty thousand years -- a period so close to our own that a great many living species of birds were already recognizable. The birds of the Pliocene -- some 4 to 5 million years back -- about which Dr. Miller and I have prepared the paper which you will hear tomorrow, were more noticeably differentiated from the birds of today, although family relationships were similar. Even as far back as Miocene time -- roughly 20 million years ago -- the family relationships of the avian fossils are not difficult to recognize.

Though, as yet, the earlier geologic deposits of California have not yielded bird remains, earlier avian fossils are known elsewhere in the United States, and in fact in many other places throughout the world. I have long hoped for an opportunity to study some really ancient fossil birds. It was therefore with the greatest pleasure that I responded to a request from Dr. George G. Simpson of the American Museum of Natural History to work over the avian remains collected on one of the Scarritt Expeditions to Patagonia, in a deposit assigned to the Lower Eocene age, presumably close to 60 million years old. These are the oldest avian fossils known from South America.

The bird bones were found in a narrow pocket of green bentonite representing a local facies in the widespread volcanic ash deposits of central Chubut Territory, Argentina. This facies is considered by Simpson to be a part of the Casamayoran Formation which he places in the Lower Eocene, geologically. Ameghino, the great South American paleontologist, had formerly assigned the Casamayor Formation (or Notostylops Zone) to the Cretaceous, which would have placed it back another 20 to 30 million years in time. Simpson's recent careful analysis of the South American deposits is undoubtedly more accurate. The fauna of this particular facies is peculiar to this one pocket which Simpson discovered. All of the animals recorded differ generically from those known elsewhere. In addition to the bird bones, which form the greater part of the collection, there have been identified an amphibian, 2 reptiles (a crocodile and a turtle) and 1 marsupial (an opossum-like marsupial, the exact affinities of which are still indefinite). It is suggested that the deposit represents a small body of water into which the volcanic ash sifted.

With perhaps 2 or 3 exceptions, the seventy-odd bird bones can be assigned to a single species -- a wader of a size comparable to the roseate spoonbill. The species, the genus, the family -- even the order -- are not immediately evident. At least eleven separate individuals are represented, two of these by several different elements of the skeleton. Specimen number 434, for example, has right and left humeri, right and left coracoids and scapulae, a partial sternum, fragments of tarsometatarsus and tibiotarsus, furcula, radius, several pedal phalanges and even a few small pieces of the cranial portion of the skull. Specimen

number 310 has many of the same elements, though it lacks the skull fragments; in addition there are ulnae, carpometacarpi, a wing phalanx, sacrum, and adjacent thoracic vertebrae. Between these two specimens nearly all of the main elements are represented, and many of these are duplicated several times over from other individuals. It would seem, therefore, that the matter of identification should not present too great a problem. As a matter of fact, however, it is likely that if there had been fewer bones found, the bird would have been assigned with greater rapidity than has been possible with this abundance of material. The reason for this astonishing statement is that one element tends to suggest one line of relationship, whereas another disputes the evidence of the first.

Let us review briefly some of the affinities suggested by the different elements:

The breastbone and shoulder girdle combine characters of the flamingoes and the swans and geese.

The humerus, though quite distinctive in certain respects, resembles several of the ciconiiforms, but particularly the flamingo, and in one respect approaches the swan.

The tibiotarsus is totally unlike the flamingo, and suggests a compromise between an ibis and a goose.

The femur is totally unlike any anseriform bird and has similarities to certain charadriiform birds and the flamingo.

The ulna is most like the Thick-knee, but is not entirely unlike the flamingo.

The carpometacarpus is very distinct in one important character, but in others resembles the geese, and in part the flamingo.

The radius is distinctive but is nearer the flamingos than any other group

may be noted
We note that the flamingo is most often mentioned, with the anseriforms next, and an occasional resemblance to the shorebirds. I believe we can disregard this latter group, however, for there are certain markedly characteristic structures of that group which are totally unlike the fossil. The few similarities probably represent parallelisms.

One small fragment of the skull clearly shows the articular facets for the lacrymal bones, ^{on the right side} indicating that they ^{lacrymal} were separate (as they are in the Ciconiiformes). In the Anseriformes and Charadriiformes the lacrymals are fused to the other bones of the skull in the frontal area. ^{on the right side} Other points of disagreement between the Anseriformes and the Patagonian bird also seem to be rather basic, more so, I believe, than the few marked similarities.

The vertebrae represented are the posteriormost ones of the thoracic series, including the connection to the sacrum. Though in a poor state of preservation, they show that the centra were not all heterocoelous, that is, they do not exhibit the characteristic saddle shape which is found in most birds. The last vertebra is mildly amphicoelous (hollow at both ends), the next two in succession maintain the tendency to concavity posteriorly, but the anterior centrum is slightly convex. The fourth from the end is saddle-shaped at the anterior end only, the 5th is typically avian at both ends. In comparison with living birds, the condition is most like that of the charadriiforms but is not identical. I am inclined to view this as a primitive condition

which has held over in the charadriiforms, but does not necessarily indicate a direct affinity with the Eocene bird in question.

The characters which resemble the flamingoes are undoubtedly significant. The many disagreements are comparatively minor ones, but are sufficient to offer at least family distinction.

Turning to a survey of other fossil forms, we find no relationship between the Patagonian Eocene bird and other avian fossils of South America. It may be best compared, rather, with the early waders of Europe, and with the little bird of the American Cretaceous, known as *Apatornis celer*. *Apatornis* has been somewhat overlooked as an entity in view of the fact that it was originally placed in the genus *Ichthyornis*, and even now remains in the same order with that famous "toothed-bird" of the Kansas chalks. Actually, *Ichthyornis* and *Apatornis* are not at all similar. Many characters of the Patagonian bird which are not comparable to any modern group of birds, can be found closely approximated in *Apatornis*, although at half the size. Unfortunately, only a partial skeleton of *Apatornis* was ever found. There are no humeri, tarsometatarsi, vertebrae, or skull parts. The bones present, however, certainly suggest relationship with the Patagonian fossils ^{but at hand}.

European waders assigned to the *Phoenicopteridae* are well represented in the Oligocene epoch, and fragmentary remains presumably related, but not of the same family are known from the Eocene, and even the Cretaceous. I should not like to base too much upon these fragments, although they do admittedly suggest a wader. *Palaelodus*, however, of the Oligocene and later, has ^{Museum of Europe}

many characters similar to the Patagonian bird. *Paloelodus* is considered to belong to the *Phoenicopteridae*. But though the South American bird is closer to *Paloelodus* than to *Phoenicopterus*, I should say that it is still removed from that family, as it does not bear as close resemblance to the modern flamingoes as does *Paloelodus*. As a true flamingo is known to have existed ^{in Europe} contemporaneously with *Paloelodus* ^{in the Oligocene} it is quite possible that the ^{probable} *Paloelodus* ^{flamingo-like} latter bird represents another branch of the family which died out toward the end of the following geologic epoch. Was the Patagonian bird perhaps a forerunner of the *Paloelodus* line? Or does it represent another line of waders, long since extinct? Or was it a southern-continent hold-over of an earlier generalized ancestral wader whose descendants scattered more widely? The similarity to *Apatornis* lends credence to the latter interpretation.

I am not ready at this point to make a definite assignment of this interesting fossil bird. A new species, and a new genus it will surely be; in all probability, a new family. As to its ordinal position, I believe it is likely that it should be placed with *Apatornis*, though I am not at all convinced that that order should be the *Ichthyornithiformes*. What started out as a problem of a South American bird of the Eocene, may involve a resurvey of the North American Cretaceous before it can be brought to completion.

I should say that my hope of becoming involved with ancient birds is well on the way to realization.